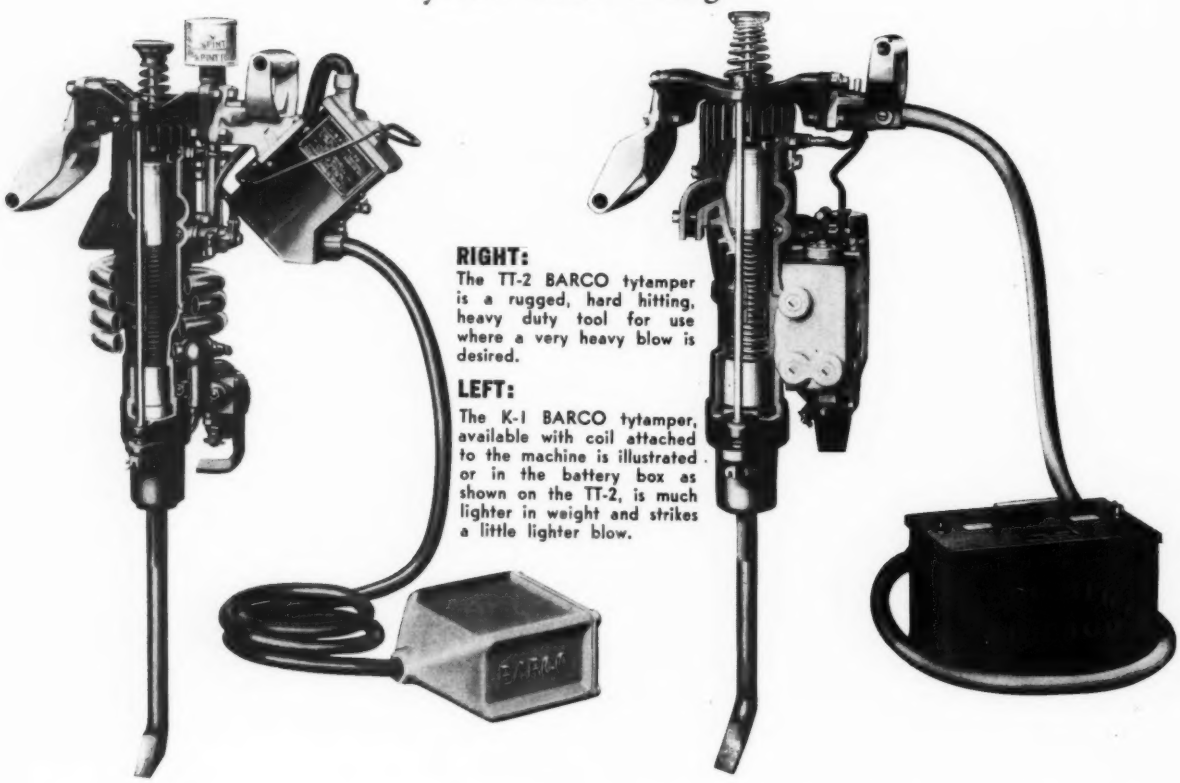
Railway Engineering and Maintenance

DECEMBER, 1938

To Lower Track Maintenance Costs

. . . . Include This railroad-proved time-and money-saving tytamper in your 1939 budget



RIGHT:
The TT-2 BARCO tytamper is a rugged, hard hitting, heavy duty tool for use where a very heavy blow is desired.

LEFT:
The K-1 BARCO tytamper, available with coil attached to the machine is illustrated or in the battery box as shown on the TT-2, is much lighter in weight and strikes a little lighter blow.

The increasing use of BARCO Unit Tytampers by 37 railroads demonstrates conclusively that here is a time- and money-saving tool that should have careful consideration when preparing your 1939 Budget.

Constructed to give long, trouble-free service on tamping and crib busting operations . . . equally efficient and economical for breaking frozen coal and cinders, chipping ice in terminal switches, and for speedy handling of many other Summer and Winter jobs . . . these versatile, portable units are easily carried from place to place by one man, and are ready for work when they reach the job. Their low initial cost, combined with low hourly operating cost that justifies their use on a wide variety of jobs heretofore dependent on slow, costly methods, makes their inclusion in 1939 Budgets a practical economy measure that will pay substantial dividends for many years.

BARCO MANUFACTURING COMPANY
1805 W. Winnemac Ave., Chicago, Ill.

In Canada: The Holden Co., Ltd. Montreal — Moncton — Toronto — Winnipeg — Vancouver

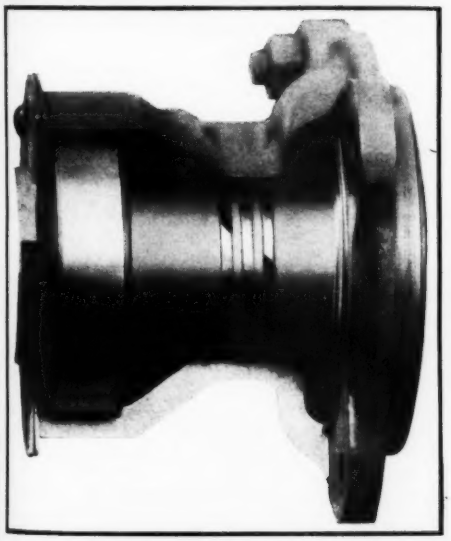
BARCO UNIT TYTAMPER

Years Ahead in Design

FAIRMONT CARS HAVE THE FEATURES WHICH SERVE YOU BEST

Performance ON THE JOB COUNTS

Three BEARINGS INSTEAD OF *Two* CRANKSHAFT KEEP THE *Fairmont* *RIGIDLY ALIGNED*



WEAR-LESS RINGSEALD PACKING HOLDS COMPRESSION HIGH

Fairmont engines have an abundance of power even after years of service because the packing of the crankshaft keeps compression like new. A slow wearing Ringseald sleeve fits snugly on the crankshaft and rotates with it as a unit. "Piston rings" in grooves on this sleeve press outward, seal this side bearing bore and make it permanently gas tight.

Power impulses, tugging at the belt drive cannot pull the crankshaft of a Fairmont engine out of alignment. 3 bearings instead of 2 hold the crank arm and pin in proper position. An outboard bearing close to the belt fly wheel absorbs the belt stresses and keeps them out of the crank throw.

Fairmont engines are available with either ball bearings or roller bearings. The roller bearings have a load capacity 40% greater than the ball bearings and give the assembly a correspondingly longer life.

The practical design of Fairmont crankshafts is an important reason for the greater economy of Fairmont engines and the wide spread popularity of Fairmont railway motor cars. For further details write Fairmont Railway Motors, Inc., Fairmont, Minnesota.

OF ALL THE CARS IN SERVICE TODAY

MORE THAN HALF ARE FAIRMONTS

INTERNATIONAL TracTracTors . . . the Most Accessible, Most Easily Serviced Crawler Tractors on the Market

Specify International TracTracTors for "off-track" work and save money cleaning ditches, banks, culverts, and under trestles and bridges; pulling ties; moving tracks; replacing rails; building grades and re-shouldering slopes; digging holes and setting posts; etc. This picture shows the compact Model T-20 on a typical job.

WHEN International Harvester engineers started laying out International TracTracTors, they designed for power . . . and for accessibility of all working parts to keep maintenance costs at the minimum. Every owner and operator knows the results—TracTracTors are the most accessible, most easily serviced crawler tractors on the market. All parts, and the steering clutches and brakes are so easy to get at that maintenance is surprisingly low. Steering clutches and brakes in TracTracTors can be inspected, adjusted, or replaced through rear cover plates without disturbing the track, track frame, or driving sprocket.

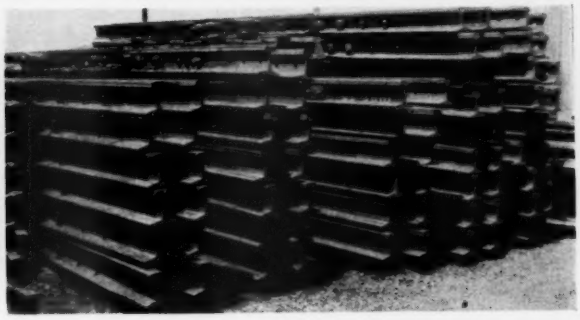
Special dust seals protect the bearings of the drive gear and pinion shaft, the track rollers, and idler bearings. Oil and lubricants are sealed in. Dirt, grit, water, etc., are sealed out.

International TracTracTors save money in crawler-tractor operation. Cost sheets of owners prove it again and again. Find out for yourself what these units can do for you. Ask the nearby International industrial power dealer or Company-owned branch for a demonstration. There are five different models (gasoline and Diesel). The International Industrial Power line also includes five wheel-type tractors (gasoline and Diesel); and 11 Power Units ranging up to 110 max. h.p. (gasoline, gas, and Diesel).

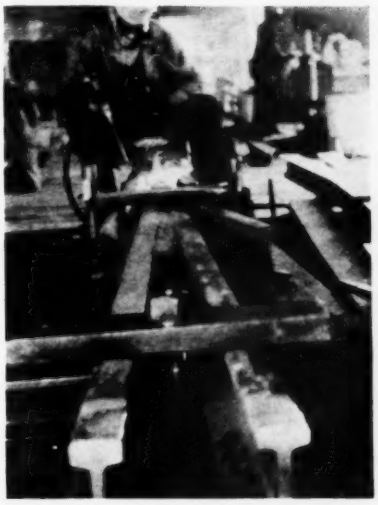
INTERNATIONAL HARVESTER COMPANY
(Incorporated)
180 North Michigan Avenue Chicago, Illinois

INTERNATIONAL Industrial Power

FROG AND SWITCH POINT RECLAMATION

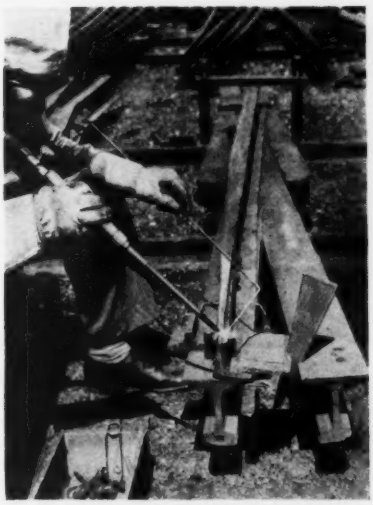


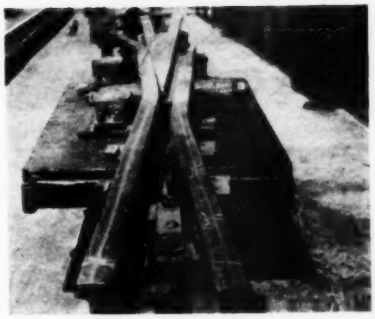
...is another profitable practice for railroads



← Here's how →
they are reconditioned by the
AIRCO OXYACETYLENE PROCESS

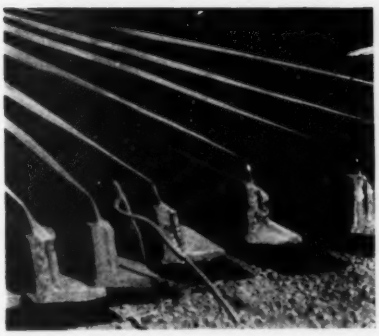
It's a comparatively simple, inexpensive operation when done with AIRCO rods specially developed for this work, and under AIRCO Procedure.





← And here →

are specimens of the reconditioned frogs and switch points —practically as good as new, ready to go back in service.



Railroads doing this work on an organized basis, are finding it one of the most profitable MW department operations. Our Railroad Engineering Department will be glad to send a Field Service Engineer to give full details to interested MW Officials.

AIRCO

AIR REDUCTION
SALES COMPANY
General Offices: 60 East 42nd St., New York, N. Y.
DISTRICT OFFICES IN PRINCIPAL CITIES

● SERVING RAILROADS FROM COAST TO COAST ●

HOW LEAD-IN TRACKS WERE LIGHTED EFFECTIVELY and ECONOMICALLY at WEST COLUMBUS

SWITCHMEN now work more efficiently under the G-E floodlights in the New York Central's 4500-foot classification yard at West Columbus, Ohio.

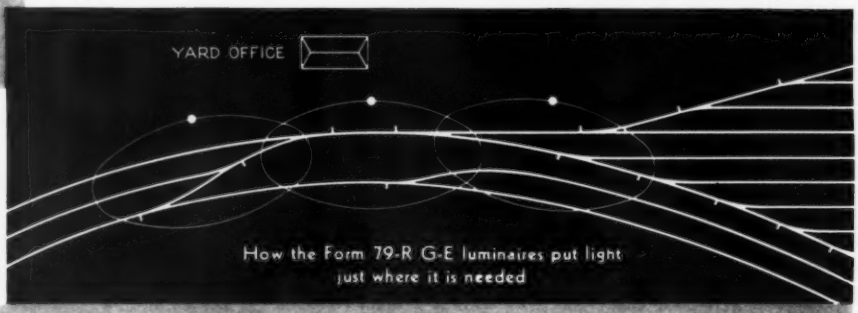
In planning this new lighting installation, it was found that the lead-in tracks could not be lighted adequately and economically by conventional methods for the switchmen's work. So the railroad's engineers and G-E representatives devised a new method by borrowing from highway lighting a new luminaire, together with an efficient mounting arrangement.

THE NEW FORM 79-R LUMINAIRE
Highly Efficient
Dust-, Moisture-, and Insect-proof
Write for Bulletin GEA-2276B

This luminaire—General Electric Form 79-R—delivers its candlepower along the tracks with minimum glare and shadow. Height and spacing between luminaires were chosen to give ample, continuous light—with little wasted. Outstanding benefits are low equipment cost, low installation cost (the luminaires are mounted on wooden poles with pipe brackets), economical control of light, and low maintenance.

For the main portion of the yard, nine G-E 1000-watt floodlights are mounted on 100-foot steel towers at both ends of the yard to provide an average of 0.15 foot-candles illumination.

Our engineers have had broad experience in all kinds of railroad lighting work and will help you select proper units from the G-E line—the most extensive line to be found anywhere. General Electric, Schenectady, N.Y.



How the Form 79-R G-E luminaires put light just where it is needed

GENERAL ELECTRIC

98-502

GAGE RODS

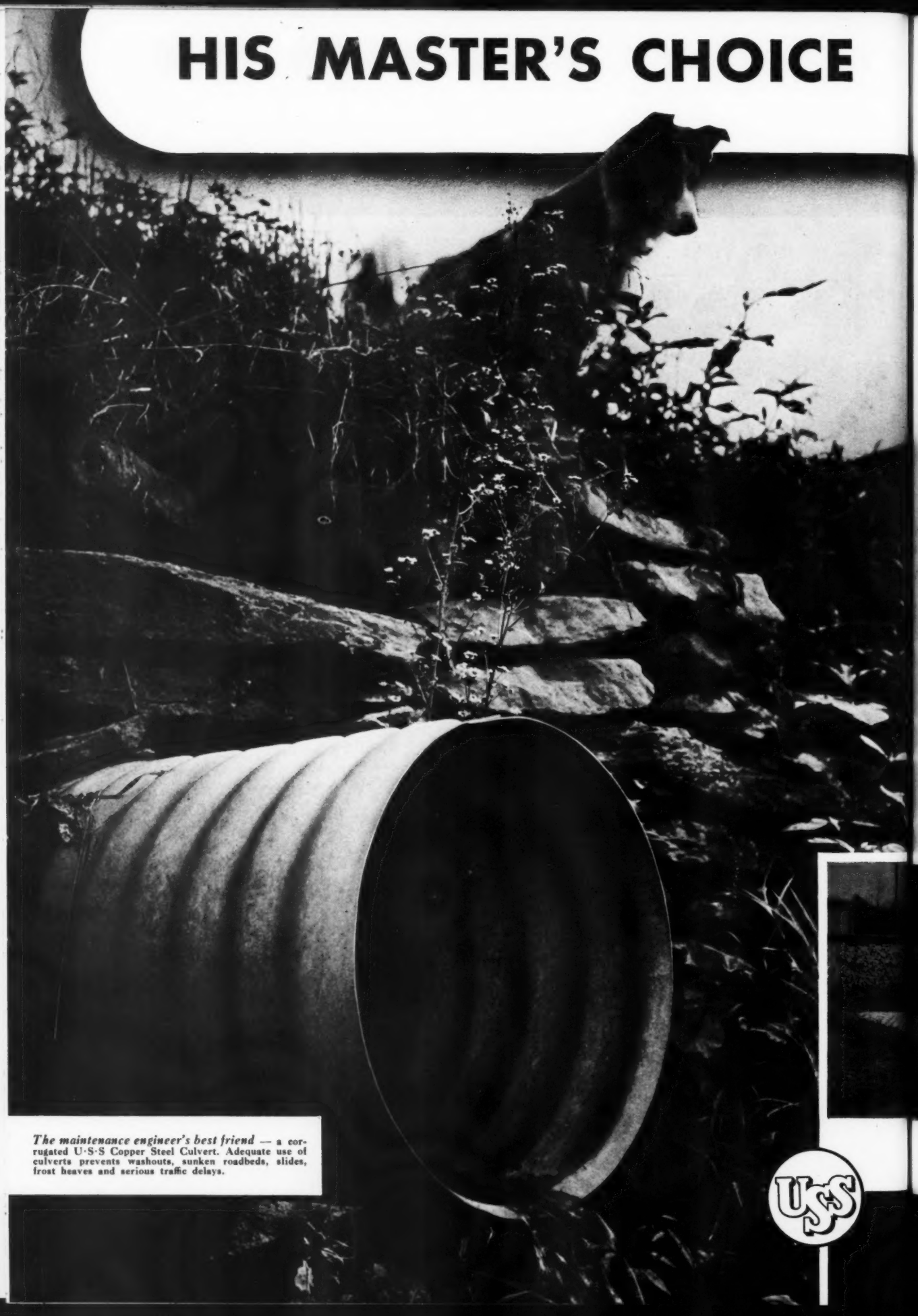
THE insulating bushing of Bethlehem gage rods gives real, permanent protection against trouble with track circuits. As a result, you need not hesitate to apply these rods to mainline tracks, where higher speeds and greater loads make maintenance of track alignment a tougher job.

This bushing fits between the adjustable malleable iron clip and the rod itself. It is made up of three parts, pressed together as a single unit. A fiber tube and washer, dipped first in insulating varnish, give positive protection against current leakage. A steel tube inside the fiber tube protects the insulation from any wear or physical damage from contact with the rod. A second, outer steel tube protects it from the clip.

Ruggedness and simplicity are features of the Bethlehem Gage Rod. A wide hook on one end is forged from the 1¼-inch rod. On the other end a single, self-fastening Unit Lock Nut holds the adjustable clip in place, regardless of pressure or vibration. The rod can be quickly and easily adjusted when installing or when realigning and leveling track.

BETHLEHEM STEEL COMPANY

HIS MASTER'S CHOICE



The maintenance engineer's best friend — a corrugated U·S·S Copper Steel Culvert. Adequate use of culverts prevents washouts, sunken roadbeds, slides, frost heaves and serious traffic delays.

USS

because . . .

It's a saving . . . not an expense to use plenty of U·S·S Copper Steel Culverts

EXPERIENCE all over the country proves that adequate drainage often saves many times its cost. When little streams go rampaging down valleys they may cause tremendous damage to railroads. Culverts and drains must be adequate or losses are way out of proportion to the original cost of system. Studies of recent road failures indicate that more attention should be paid to the size and location of culverts, drains and small bridges.

It doesn't cost much to use bigger steel culverts because drainage capacity increases much faster than culvert cost. For example, a four-foot steel culvert has about *four* times the capacity of a two-foot culvert—yet it costs *less than twice* as much to install. In fact, the cost of the culvert itself is so small compared to the cost of earthmoving and construction work, that you can't afford to take chances on inadequate drainage.

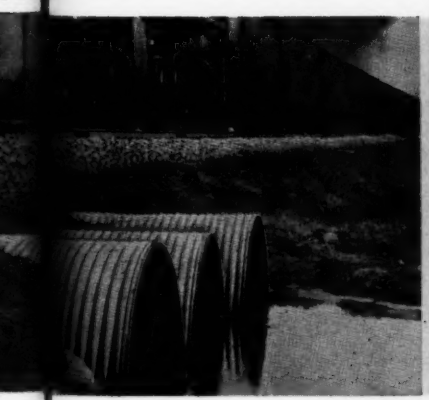
The United States Steel Corporation Subsidiairies make various types of galvanized metal sheets for corrugated culverts and, based on extensive experience and metallurgical tests, recommend U·S·S Copper Steel as the most durable and satisfactory under various soil conditions.

U·S·S Corrugated Copper Steel Culverts have the strength to withstand heavy loads and pounding traffic. They are constructed to absorb the strains of rapid freezes, thaws and shifts in subsoil without cracking. Copper Steel Culverts are light in weight, and therefore cost less to transport and less to install. They are easier to handle—do not require elaborate foundations or form work.

Write for our culvert book containing information about all types of steel culverts and how they should be installed. Our engineers are glad to cooperate in any way possible.

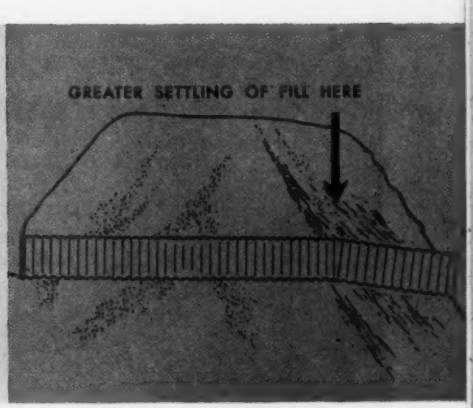
U·S·S COPPER STEEL CULVERT SHEETS

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*
United States Steel Products Company, New York, *Export Distributors*



The constant vibration and pounding of heavy traffic are absorbed by corrugated steel culverts without cracking or breaking.

Lower costs for small bridges. U·S·S Sectional Plates can be quickly bolted into position by ordinary labor crews. No expensive form work is needed and much time is saved.



Corrugated steel culverts have the flexibility to withstand soil changes. When ground settles or freezes, corrugated steel flexes accordingly.

UNITED STATES STEEL

No. 120 of a series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING CORPORATION
105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: How Orders Originate

December 1, 1938

Dear Reader:

"Early this afternoon I completed my work equipment budget for next year. As I had until evening to turn it in, it occurred to me that I should make a further check of the equipment desired and I picked up the current issue of Railway Engineering and Maintenance. Turning through its pages, I came to an advertisement of a machine that we need and had intended including in our budget but had overlooked. I immediately opened up and revised our recommendations to include one of these machines and expect that its purchase will be approved. I am calling you up to tell you of this, for your magazine stood me in good stead in this instance as it has on numerous occasions before."

This was the substance of a telephone message that we received during the last month from a system engineering officer of one of our largest and most active railways. It illustrates a type of service provided by Railway Engineering and Maintenance that is of value to you as readers and also to those manufacturers who bring their products to your attention through our advertising pages. It is a service that we are certain is utilized on many occasions and yet one which seldom comes to our attention in these busy days.

I am sure that many of you who read Railway Engineering and Maintenance so regularly could duplicate this incident in your own experience,—especially in these days when your needs so far exceed your available appropriations and you are forced to make your selections with so much greater care in order to secure the largest possible returns from such expenditures as you make.

And I anticipate that you are far ahead of me in the thought also that the order which will very probably materialize from this one incident will alone go far toward compensating this manufacturer for his entire year's campaign of advertising in Railway Engineering and Maintenance.

We would like to hear of similar experiences of yours.

Yours sincerely,

Elmer T. Howson

ETH:EW Editor

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

GET RID

OF RAIL JOINT MAINTENANCE

in CROSSINGS

Thermit welding equipment may be set up at a central location for welding rails into 200 to 300 ft. lengths. Such rails are readily transported for installation at crossings.

Upkeep of rail joints in grade crossings, with all its costly ripping up of pavement is one item of maintenance expense that you can get away from easily. Thermit Rail Welding is the answer.

Rails, Thermit welded into 200 to 300 foot lengths, can be installed in crossings at little cost, and, as far as joints are concerned, forgotten for the life of the rail; which, in itself, is lengthened appreciably. With no rail ends to batter, no angle bars to wear, no bolts to tighten; there is nothing to require attention. No reason to disturb the crossing pavement.

Light, compact and low in cost, Thermit welding equipment is as well suited to this type of work as it is to the welding of continuous stretches a mile or more in length. Equipment is readily mounted on cars and shipped from one point to another. Or, it can be installed at some centrally located yard and operated as a plant to turn out lengths of welded rail for shipment to required points. A comparatively small investment is involved, even when a complete welding outfit is furnished to each division.

Our nearest representative will be glad to go into the matter with you. Or, write for full particulars on Thermit Rail Welding, both for long continuous stretches, and for short lengths for use in crossings, stations and paved streets.

METAL & THERMIT CORPORATION, 120 BROADWAY, NEW YORK, N. Y.
ALBANY • CHICAGO • PITTSBURGH • SO. SAN FRANCISCO • TORONTO

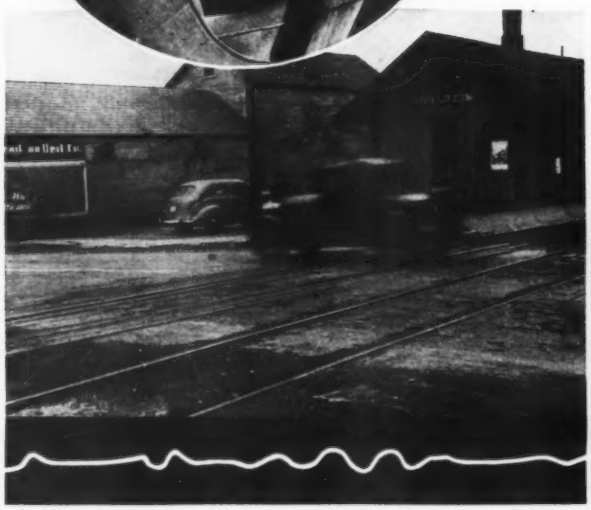
THERMIT Rail WELDING

"RIDE-O-GRAPH"

registers approval of

TRUSCON WELTRUS HIGHWAY CROSSINGS

At left: Testing highway crossings with the "ride-o-graph" a seismograph-type instrument which traces a line on a roll of sensitized paper to register roughness or smoothness of highway crossings.



Ride-o-graph record of bumps and jolts suffered by motorists when riding over the moderately rough highway crossing illustrated above.

Ride-o-graphic record of the typically smooth riding comfort of motorists passing over the Truscon Weltrus Crossing illustrated above.

Contrast the "ride-o-graph" record of the rough crossing (at left) with the Truscon Steel WELTRUS Crossing (at right.) Which is the liability, which is the asset in relation to public good will toward railroads? • Train travelers are usually car owners. Certainly every motorist is a prospective user of railroads with their improved safety, comfort, speed and economy. Good will or ill will pop up in many places. Every highway crossing is one of those places. • Investigate the *investment* advantages of Truscon Steel Highway Crossings. Their cost on an annual basis spells economy of highway crossing maintenance, improvement of safety conditions and protection of public good will. Our engineers will co-operate in your investigation. As a starter, send for illustrated catalog of Truscon Steel WELTRUS Highway Crossings.

TRUSCON Steel company

YOUNGSTOWN · · · OHIO

57 SALES ENGINEERING OFFICES

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Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

DECEMBER, 1938

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REINFORCING DRIVE DOWELS

(Patented)

"Four years in the wood and still good as new" . . . that's the report from railroad after railroad of the service rendered by Giant Grip Dowels!

The mission of the Giant Grip is to prevent splitting—and they do just that—they hold indefinitely.

The life of this dowel is 'way beyond expectations of the user—and we feel results justify our belief that they will outlast the tie—and hold as long as there is anything to hold!

Maintenance men will be interested in the savings made possible by the Giant Grip.

Let us send samples—

Make your own tests—Write today!

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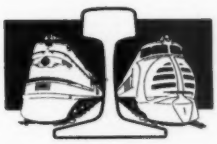
Railway Engineering and Maintenance



A Program

For the Rehabilitation of the Railways

FOR nine years the railways, in common with other industries, have been passing through the most acute and the most prolonged depression in history. This depression has exacted a severe toll from them, as is evidenced by the fact that, in spite of the most drastic curtailment in expenditures for maintenance and other purposes, there is a larger mileage in the hands of the courts today than in any previous period in history.

This situation is of serious concern not only to those who have invested their savings in the railways, looking to a return therefrom in their dependent years, and to those who, after long years of service, look to the railways for continued employment and livelihood, but also to that large body of citizens who are dependent on an efficient, prosperous system of railways for those services that are essential to national prosperity and national defense in a country of vast distances.

With the increasing recognition of this necessity for an efficient railway system on the part of the public, inquiry is being made in many quarters regarding the measures that are necessary for the return of the railways to a condition of reasonable prosperity. Out of these studies there are appearing a number of programs for action. One was presented some months ago by a group from the Interstate Commerce Commission. Another was presented within the last month by the Railway Business Association. Still another is now being formulated by a committee of six, representing railway management and labor, appointed by the President.

A Program for Recovery

The most comprehensive program, and the one that springs from the most intimate knowledge of railway conditions, is that formulated by the Association of American Railroads. This program, by reason of its authoritative origin, is deserving of most careful consideration by employees and the public alike. It comprises some 19 points, divided between those measures demanding immediate attention and those which require more extended consideration.

Among the measures presented for immediate action by this organization are the following:

(A) The revision of the rate-making rule. The experience of recent months has demonstrated the necessity for giving the railways greater latitude in pricing their product to enable them to meet sudden and wide fluctuations in expenses. This can best be accomplished by revising the rate-making section of the Interstate Commerce act to direct the Interstate Commerce Commission to consider the revenue needs of the railways as a primary consideration in fixing rates.

(B) Facilitating loans to railways. Under present legislation the Reconstruction Finance Corporation is permitted to loan money only to those railways that the Interstate Commerce Commission finds are not in need of reorganization. If this law were modified to permit such loans to be made upon the prospects of future earnings, it would be helpful to a number of railways that, under more normal conditions, could arrange their own financing but are suffering at this time from reduced traffic incident to the business recession, and would promote the purchase of materials that are now sorely needed.

(C) Repeal of land grant statutes. When the railways were given governmental aid in constructing some 17,627 miles of lines in undeveloped areas, it was provided that in return they should give the government preferential rates in the transportation of its employees and materials, then confined to a few departments. The sums so advanced have long since been repaid with interest through these rate concessions, but some 69 independent agencies and departments of the government are still profiting from this legislation. The repeal of these statutes will increase the revenues of western and southern roads more thon $7,000,000 annually.

(D) Federal barge line. One of the most conspicuous instances of the government engaging in competition with privately-owned and privately-operated transportation agencies is the Federal barge line, operating on the Mississippi and other rivers. Congress should, by appropriate legislation, discontinue the operation of this line and provide for the sale or disposal of its properties in accordance with its clear intent at the time the Barge Line act was passed.

(E) Regulation of water transportation. At the present time the railways and public carriers on the highways are regulated in their principal activities by the Interstate Commerce Commission. In an attitude of fairness to all agencies of transportation, it is obvious that water transportation should be regulated in the same

way and to the same extent, as proposed in the Wheeler-Ramspeck bill, providing for the regulation of water carriers by the Intertsate Commerce Commission.

(F) Long and short haul. For years the railways have pointed to the inequity of the land-and-short-haul clause of the Fourth section of the Interstate Commerce act, which prevents them from meeting the competition of water carriers operating through the Panama canal without reducing intermediate rates proportionately. The Pettengill bill to repeal this clause has passed the National House by a two-to-one vote and has been favorably reported by the Senate Committee on Interstate Commerce. Its passage by the Senate would restore to railway managements the right to make fair and reasonable rates to meet competition.

For Future Consideration

In addition to these measures, which will do much to restore the railways to a condition of solvency and which can be made effective with little delay, the situation requires other changes of equal or even greater importance; but which should have more extended consideration and opportunity for the crystallization of thought. These measures include the revision of legislation dealing with consolidations to give the railways greater freedom in working out unifications along natural lines through negotiation; the revision of the Railway Labor act to remove difficulties evident in present legislation; the enlarging of the authority of the Interstate Commerce Commission over intra-state rates to prevent the nullification within the states of adjustments recognized as essential by the National commission; the enactment of legislation providing for a system of tolls to be charged for the commercial use of inland navigable waters other than harbors and the Great Lakes, sufficient to yield a fair return upon the investment by the government for the improvement of these waterways, together with the cost of their maintenance; the enactment of legislation making effective the present widespread recognition that the government should bear the expense of eliminating grade crossings; the revision of legislation, relieving the railways of the expense of reconstructing bridges over navigable waters and floodways to provide for changes in these waterways that are not of their making and of no material benefit to them; etc.

Railway Prosperity Brings National Prosperity

These and other measures for the aid of the railways are proposed on the ground that a revival of railway prosperity will stimulate a revival of national prosperity. If the capacity of the railways to make purchases and to employ men is restored to normal levels, much progress will be made in solving the problem of improving business. If the railways could have spent in 1938 what they did spend in 1929, more than 2,000,000,000 additional dollars would have been poured into the channels of business, an amount sufficient to have given a tremendous impetus to recovery.

By emphasizing these measures, railway employees can contribute not only directly to the improvement of the status of the industry in whose recession and whose prosperity they inevitably share, but can also contribute to the recovery of the entire nation, thereby rendering a service of large magnitude.

Winter Work

Guard Against Lost Motion

DURING the last 15 or 20 years, coincident with the development and widespread use of work equipment, great strides have been made in methods and in organizations for carrying out many classes of maintenance of way work, with largely increased production per employee and materially reduced unit costs. It is an enviable record of achievement in the face of conditions so unlike and immeasurably more difficult than those found in industry generally, with which maintenance methods and operations are often so erroneously compared. It is true that under the more favorable conditions of centralized plant and supervision, shelter and modern machinery, many branches of industry could for many years point to achievements in increased efficiency and production which appeared to outstrip maintenance of way operations. And it is possible that, handicapped by widely scattered work, necessarily decentralized supervision, widely varying weather and other working conditions and the interference of traffic, the output or efficiency of maintenance of way forces will never reach that of piece-work industrial employees. But the record of achievement of these forces is no less striking, and is highly creditable to officers and men alike.

Only in part has this been brought about by improved tools and work equipment. Organization and more intensive supervision have also played a large part, and wherever these three factors have been combined, the results have been increased efficiency and reduced costs, with, almost invariably, improved quality of work.

An unfortunate fact is that all maintenance of way operations do not lend themselves to the same degree of supervision and organization, or to the same effective use of labor-aiding equipment. Herein lies a continuing field for development and watchfulness, to the end that the costs of these operations may be reduced to a minimum. This places a responsibility on every supervisory officer, particularly at this time of the year when the heavy work organizations of the spring, summer and fall seasons have been broken up, when much of the equipment suitable to the work of these seasons has been tied up for the winter, and when the mass production methods adapted to much of the work of these seasons give way to widely varying winter operations less susceptible to planning and organization.

Many men must be retained in the maintenance of way department during the winter, if only to meet the emergencies of storms. This condition could not be otherwise, but this period of the year offers much op-

portunity for lost motion among the men unless special attention is given to programming suitable work and to seeing that it is carried out effeceively in spite of the added handicaps imposed. There is much work that can be done during the winter—that should be done—in order to get it out of the way and to prevent its interfering with heavy summer work schedules, and it is in the interest of both the men and their companies to see that such work is done at that time, and in the most efficient and economical manner possible.

Building Work

A Growing Field for Improvements

OF all maintenance of way employees, those in the building department as a whole, from supervisory offices down to helpers, have been the hardest hit by the depression years. Year after year they have seen their properties literally get "the crumbs from the budget table," and starve for even the most meager maintenance allowance. Year after year they have witnessed their positions absorbed and their forces dwindle in size. They have been characterized as the "forgotton men" on the railways, and on the face of things have reason to believe this is a reality. On the other hand, any one of them who feels discouraged, and thinks that the opportunities for the building man on the railways are passed, should read the comments in this issue by L. P. Kimball, engineer of buildings, Baltimore & Ohio, on Current Trends in the Design of Railway Buildings. As made clear in these comments, there are growing developments and trends in railroading which, over a period, promise to bring the building man back into his own.

It is true that for a time building men have had to stand aside while practically all of the available maintenance money has gone into the main line tracks and other facilities essential to improved service and to protecting the safety of train operation. And the picture in this regard has not changed materially as yet, but it is interesting to note that some of the very things which have been demanding the available funds of the roads in recent years are now calling for the alteration and modernization of buildings and related facilities to keep pace. Thus, a number of roads are finding it desirable, if not essential, to improve the appearance and standard of maintenance of the station buildings at at least the scheduled stops of their modern high-speed trains; to construct new servicing facilities for these trains; to alter existing buildings for reorganized or consolidated forces; and to adapt many freight-handling facilities to the changed conditions being brought about with the growing coordination of rail and truck service.

Moreover, there are many new trends in building design, in improved building materials, fittings and equipment which, because of enhanced appearance, increased service life, reduced maintenance or economies of operation, are pressing the railways hard for more widespread adoption. In his comments, Mr. Kimball points out that there is no other assignment on the railways today that offers such a diversity of problems as those confronting the building man. This should be a stimulant to those building men who have viewed the situation otherwise, and, in fact, a challenge to their ingenuity and initiative to search out the opportunities for improvements and economies in their field, and to press for their adoption in the interest of their roads as a whole.

Insulation

Can Be Made To Pay Large Dividends

THIS is the season when the advantages of thermal insulation become most apparent, for it not only reduces the amount of fuel required to heat buildings, but it adds greatly to the comfort of the occupants. Unfortunately, however, the railways are far behind other industries in their use of insulation—unfortunately, for when properly used, it can be made to pay large dividends. In recent years the railways have made great progress in efficiency and economy, both in operation and in the use of materials. In this campaign, however, the benefits to be derived from reducing heat losses in buildings have received little attention.

In view of the low level of revenues for almost a decade and the necessity for applying such funds as have been available in large part to the track and bridges, it is easily understandable why buildings have been neglected during this period, for, in general, they do not affect the safety or continuity of train operation. With prospects now more encouraging than for several years, the question of thermal insulation is one to which both managing and operating officers should give serious consideration.

Many railway buildings, particularly those of frame construction, were designed with little thought about the conservation of heat. Few of them are weather tight, and much of the potential heating value of the fuel burned to heat them is dissipated through the walls, the roof and the floor. In many cases, properly applied insulation, combined with more efficient methods of heating, will save from 25 to 75 per cent of the fuel now being consumed for heating purposes. It is unlikely that there will be any dissent with the statement that every new building that is to be occupied, from a general office to a switchman's shanty, should be insulated during construction. There appears to be considerable doubt in the minds of railway officers, including some building engineers, as to the advisability of applying insulation to existing buildings.

The advantages of doing so are scarcely open to debate, for it has been demonstrated time and time again that properly applied insulation and the stoppage of leaks around door and window frames will save enough fuel to pay for the installation and the carrying charge in from three to five years, depending on the weather tightness of the building as it now stands.

After almost a decade of neglect, the building situation on the railways is such that the majority of buildings require major repairs. This is a matter that is pressing heavily on most roads today and, as more funds become available, a vast amount of deferred building maintenance must be made up. The most favorable time to apply insulation will be while these repairs are being made, since it can then be done at a minimum cost.

Are You Ready for Winter?

Top—A Tractor, With Front-End Loader, Clearing Terminal Driveways. Directly Above—Shows the Effectiveness of a Switch Heater Installation at a Large Passenger Terminal

By I. H. SCHRAM

Engineer Maintenance of Way
Eastern District, Erie, New York

"ARE you ready for winter?" sounds much like the war headlines we have become accustomed to read almost daily in the newspapers of late, and as we think of our winter preparedness campaigns, the comparison is not very remote. In both cases, preparedness has its physical side, the repair or acquisition of the "heavy artillery"—snow plows, box-car flangers, steam blowers, snow melting systems, bulldozers, trucks and perhaps horse-drawn plows; and the providing of the "small arms"—snow shovels, brooms, platform scrapers, salt supplies, etc. There is also the matter of organization, two of the most important features of which consist of the preparation of snow station lists for the supervisory forces, and provision for obtaining or assigning the additional labor that the various snow conditions may demand.

Cheaper To Be Prepared

All of this matter of preparedness has a financial side, for preparing for winter costs money—and money cannot be wasted in these times. There must be a good reason for spending every dollar. There is justification for spending for preparedness, and the reasoning is the same as in the case of rearmament. By spending what is required for preparedness in either case, we are spared the disaster that may be caused if the feared "storm" masters us. Those of us who have seen lines blocked for days and communities running short of supplies, fuel and food, know that to be mastered by a storm can become a serious disaster, with a cost in lost traffic and later expense to open up lines that is many times greater than the cost of the preparations that would have prevented the tie-up.

The handling of snow may be divided into several phases, each solved differently. These divisions are, generally speaking, snow handling out on the line, and the clearing of yards, station layouts, large interlocking plants and terminals. All of them have the common organization feature—the forces must know their stations and their equipment, and must be drilled and educated in their assignments and work.

Advance Storm Warnings

In addition to other measures of preparedness, the snow fighting forces must receive suitable storm warnings. To provide such warnings is not always an easy matter, as, in many places the usual storm warnings are not very reliable. On the eastern seaboard, for example, a storm moving out to sea, and, therefore, scheduled to miss the coast of New England, New York and New Jersey, may meet a high barometer area and be turned back westward far enough to strike the metropolitan terminals. We, therefore, supplement the usual Weather Bureau reports with special government reports; by keeping in touch with airports that have north and south air lines, and by keeping our own check on the movement of east and west storms.

The night operating organizations are also utilized in securing and disseminating storm warnings. Each dispatcher's office checks the above sources of warnings at night and promptly notifies the division engineer and track supervisors of approaching storm conditions. These men are then responsible for deciding when to call out the snow-fighting forces. This night warning arrangement is quite important in the area surrounding New York, where the suburban service is highly developed, largely electrified, and with a peak in the early morning. In this area there is also a considerable mileage of third-rail electrification, which must be given special protective measures as soon as a storm starts.

The terminal having the heaviest traffic in the New York Metropolitan

Propounding the most important question in the minds of maintenance of way men at the moment, the author of this paper, speaking before the Maintenance of Way Club of Chicago on October 24, said that to be unprepared to meet winter snowstorms is more costly than adequate preparedness and, about large terminals, invites disaster. Points stressed include the necessity for preliminary organization, a trained force and adequate materials and equipment

Several of the Larger Terminals Serving New York, Including the D.L.&W. Terminal at Hoboken, N.J., Shown Above, Are Piped for Snow Melting by Steam from Their Power Plants

area is that at Jamaica, on the Long Island railroad. This terminal has 550 movements by third-rail power and about 100 or more back-up and switching moves every 24 hours, with nearly one movement every two minutes throughout the day, and more than one each minute during the rush periods. Grand Central terminal has 260 trains; the Pennsylvania terminal (excepting the Long Island) has 250 trains; the Erie has 273 trains; and the Delaware, Lackawanna & Western has 300 trains. All of these trains must be moved in congested terminals and through interlocking plants. Obviously, under such conditions, the work of handling snow storms must start with the storms, which condition makes a warning and call system highly essential. With the forces organized and the snow handled as it comes, without an opportunity to pile and drift, only a storm of exceptional intensity can cause serious delays.

Third-Rail a Problem

Snow handling on the line is carried out in a more or less uniform manner everywhere. Box-car flangers built for either single or double track, engines with pilot plows, Jordan spreaders and wedge or Russell plows are used, generally in the order named, as the snowfall becomes heavier. Few rotaries remain in the East, and those that we have are seldom used as we endeavor to handle the snow as it comes, and never let it accumulate to the point where rotary plows are necessary. Ordinary snows can usually be handled with the flanger cars, but often light trains are run between the moves of the flanger, particularly at night in suburban zones, after the evening rush, to help keep the snow down. Where possible, the engines on these light trains are fitted with pilot plows or flangers.

On some roads, flanger cars are fitted with rotary brushes. These have been found effective on third-rail electrified lines to clear the space between the track and the third rail. On such lines, flanger cars are fitted with shoes to clear the third rail. These roads also employ chloride cars, which throw a hot solution on the third rail to free it of ice accumulations.

A very necessary measure in these days of heavy highway travel is the protection of flangeways at busy road crossings. Unless guarded against, these pack solid with ice and snow and are liable to cause derailments. Where possible, they are kept salted and cleaned by crossing watchmen, but at many points we have found it necessary to use flying squadrons of men which are moved in motor trucks from crossing to crossing to clean out flangeways. The trucks employed are our regular maintenance of way trucks, which are equipped with plows in winter and assigned to snow removal work during storms. They are manned by carpenters, masons or extra trackmen and are given assigned routes. The plow attachments are very useful for opening up crossings, and for clearing station and teamtrack driveways blocked with snow.

Where possible, these plow-trucks are used on low station platforms, where they do the work of many men. Wide wood snow pushers, and sometimes horse-drawn wood plows, are also used on platforms. Platforms in suburban zones present a considerable problem during severe snow storms, and forces are frequently enlisted from outside agencies through station agents to remove the snow. In some cities, it is possible to arrange with contractors for furnishing bulldozers, trucks and truck-plows to clear station, freight house and teamtrack layouts. We have done this and have found such contractors reliable.

Interlockings a Problem

In all suburban territory, interlocking plants are frequent and it is essential that they be kept open. In the olden days, we used plenty of men, generally picked up by labor agents and supervised by the regular trackmen. These men were a source of worry as they seldom had adequate clothing, shoes or gloves, and could not protect themselves where visibility was poor. As a result, many injuries occurred. Interlocking plants are now taken care of, almost invariably, by snow melters of some kind. On electrified lines, electric snow melters are commonly used, while on other lines in towns where commercial gas is available, gas heaters are frequently used.

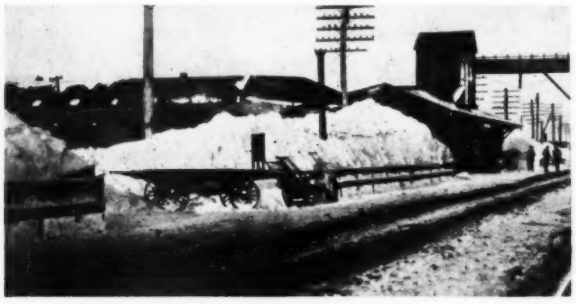
In recent years, the burners of the gas heaters have been improved considerably and good results have been obtained, particularly where natural gas is available. There is some moisture in artificial gas, and this must be removed by drip pots or the gas lines will freeze up in temperatures below 25 deg. It is also highly important that the gas supply lines be

of sufficient size and that the gas companies keep up the necessary pressure. Where the pressure is liable to drop, a pressure booster is advisable. Properly operated, both gas and electric snow melters are efficient.

In recent years, oil pots have been put on the market by at least two companies, which have been invaluable in many locations. At outlying plants where gas is not available, they are the best possible device, and since the units are small, the heating system is flexible and can be adapted readily for single switches or for long double slips. These pots require some attendance in heavy winds and give the best service if the wicks are kept adjusted and trimmed. A tank of ample size to hold a supply of kerosene for a long burning period is desirable.

One of the hardest kinds of storms to fight is the freezing sleet storm, particularly if the rain turns to freezing snow. In such storms, the snow has a tendency to arch and freeze over nearly every kind of heater. From my experience, such conditions can best be conquered by the use of snow melting oil burned from approved cans. The flame from this oil vaporizes snow and ice, which makes it a great aid in sleet storms. Its use is particularly valuable at power interlocking plants as it permits clean contact at the switch points. It is also valuable as a standby for use if gas or electricity fails. The use and storage of this oil must be governed by exact instructions as it is explosive under some conditions. We have used it for many years, however, without an accident.

Left — Highway Crossings Present a Special Problem in Winter



Right — Passenger Station Platforms Cannot Be Permitted to Become Blocked

Steam Still Used

Terminals laid out in the open are very similar to large interlocking plants when it comes to fighting snow storms, and are handled in much the same way, except usually on a larger scale. On the west side of the Hudson river at New York, all of the large terminal track layouts were equipped many years ago with steam heat for snow melting, and this system has proved so successful that it has not been changed for the newer methods that have been developed. This system, which is simple and effective, consists of steam mains supplying steam at about 70-lb. pressure to coils extended transversely beneath switch points, movable frog points and interlocking devices. In recent years, traps of new design and improved drains have been installed generally, and means have been provided for blowing out the lines with air after use. As a result, damage to the lines by freezing after a storm, when the steam has been turned off, has been eliminated. Naturally, a power house of ample capacity is required for this type of system as insufficient steam pressure leads to frozen lines at those points furthest from the mains. For such locations, however, the other types of snow melters are available, and selection can be made on the basis of reliability and cost of operation.

In Freight Yards

Terminal and other freight yards must also be kept open since the delivery of freight in large cities cannot be interrupted as much as a day without the possibility of food and fuel supplies running short. Even though some milk, dairy products, meat and vegetables, and some coal, move partly by truck, it generally happens that during heavy storms the highways become blocked and greater demands are thus placed on the railroads. Not only must milk and freight trains be brought into the terminals, but the milk and freight must be delivered. At such times Jordan spreaders, locomotive cranes and snow elevating machinery are used for piling and loading snow, and engines equipped with steam lines and jets for blowing snow out of switches save a great deal of labor.

Labor Still Essential

In spite of all of the equipment that has been mentioned, extra labor must still be used to fight snow storms, although not to the same extent that we employed it before we had the equipment. Part of the organization worked out in advance should cover the procurement of this labor. Most cities, towns and villages have idle men during the winter, whose addresses can be kept by the section foremen, and relief bureaus and other employment offices can usually furnish help. In addition, furloughed trackmen from seasonal gangs usually wish to get this extra employment. All of these sources should be carefully listed. When the men report for work, they should be checked to see that they have adequate clothing; proper tools should be assigned to them, and experienced men should be put in charge of them. It is also important that arrangements be made for feeding the men; that regular forces be relieved for rest at intervals so that there will be regular men to supervise the extra forces at all times; and that adequate timekeeping arrangements be made so that the extra men can be paid off promptly when their services are no longer required.

Let me emphasize again, that in coping with snowstorms, there is nothing more valuable than proper organization, planned in advance, in which every man knows his location; in which machinery and special equipment are ready and are handled on a pre-determined schedule; in which those from all departments charged with supervision are at their assigned posts to make decisions and to handle emergencies; and in which all supplies are on hand where needed.

These Views Show a Movable Point Frog Equipped with the Electrical Heating Units, Before and After a Snow Storm

By L. Wyant
Signal Engineer, Chicago, Rock Island & Pacific, Chicago

Electric Switch Heaters

Solve Winter Problem at Important Interlocking

This article describes the sizable installation of electric heating units at the more important switches and movable point frogs at the Rock Island's Gresham interlocking, in Chicago, and points out that their one storm test thus far, on April 6, 7 and 8, 1938, indicates that the units will be effective and economical.

THE Gresham interlocking plant, located near 88th and South Halsted streets, Chicago, is one of the most important on the Chicago, Rock Island & Pacific, controlling a junction of the main line with a heavy traffic suburban line and a crossing with a double-track line used by passenger trains of the Baltimore & Ohio, and the Pere Marquette. Traffic through this plant is heavy, especially from 5:52 a.m. to 7:52 a.m., when 37 trains pass this point, and from 4 p.m. to 6 p.m., when 35 trains pass. During the balance of the day, from 8 to 15 trains per hour cross this junction.

The tracks lie in open country, with little protection from the wind. In periods of heavy snowfall, this plant has been difficult to keep open. Even with a man stationed at each switch, it remained a difficult job because the passage of trains over a turnout on one route wedged snow and ice about the switch points in such a way that it was impossible to throw the switch until the points were again cleaned out. This condition frequently resulted in serious and costly train delays; a six-minute tieup on one occasion is reported to have caused delay to 12 important trains.

To cope with this situation, the Rock Island, in January of this year, applied Westinghouse heating elements to the rails of the most important turnouts in the Gresham interlocking: three No. 10 turnouts, two No. 15 turnouts, two No. 10 double slip switches, and one No. 10 movable point frog. In all, 32 heating units were installed.

These heating elements consist essentially of a coiled nickelchrome wire centered in magnesium oxide and enclosed within a nickel silver tube 9/16-in. in diameter. The active heat-radiating element of nickelchrome wire is varied in length and in heat output according to the location in which it is applied. For the No. 10 turnouts the wire is 15 ft. long, of which 6 ft., extending from a point slightly in advance of the switch point through the distance in which the switch rail makes contact with the stock rail, is rated at 350 watts per ft., and the other 9 ft. is rated at 125 watts per ft. The element placed on a No. 15 turnout is 18 ft. long, of which the first 7 ft. rates at 350 watts and the remainder at 125 watts per ft. On the movable point frog and on the center points of the slip switches, a 14-ft. unit is doubled back upon itself and rates uniformly throughout at 350 watts per ft.

The heating tube is secured against the web of the rail under the ball by "VV" conduit clamps held by ¼-in. stove bolts running through holes drilled in the web. The elements are non-rigid.

At either end of the heating elements a brass male connection is

(Continued on page 779)

Winter—Presents Problems

Many Roads Will Soon Be Confronted With Conditions Like This

EVERY season of the year presents problems to maintenance of way men in the track, bridge, building and water service departments alike, and at any time throughout the year they may, and frequently are, confronted with serious emergencies. However, for the more northerly roads, winter, with its snowstorms and low temperatures, and its constant elements of uncertainty, presents some of the most serious problems—problems which can readily become insurmountable if not anticipated and prepared for, with delays to traffic, inconvenience and hardship for patrons, and largely increased costs. Fortunately, many of the potential problems of winter can be anticipated and guarded against. The measures to be taken are many and varied, and involve all maintenance departments. These measures are reviewed in the following by two track officers, an assistant bridge engineer, an engineer of buildings and a superintendent of water service.

Track Forces Must Be Prepared

By F. J. LISTON

Roadmaster, Canadian Pacific, Montreal, Que., Canada

MAINTENANCE men should never borrow trouble, but those who do not anticipate and prepare for it in advance are headed for disaster. Nowhere is this more true than in preparing for the problems arising with winter, with its snowstorms, sub-zero weather and thawing spells. The efficient handling of the snow and ice on both railway terminal and line divisions requires a detailed plan of organization involving the operating and mechanical departments as well as the maintenance of way department, so that each will understand the part that it is to play and will be in a position to co-operate when required.

Many storms come without warning, and when they arrive traffic must be kept moving at all costs. The first days of October are none too early to begin planning. Every unit of mechanical equipment should be tested to insure that it is in proper working order, and it should then be forwarded to its assigned location in the snow-fighting plan.

On line divisions, proper measures should be taken to see that all culverts, ditches and waterways are thoroughly cleaned; that the bottoms of the ditches have been maintained to a uniform grade, thus preventing water pockets; and that the material removed when cleaning these drains has been properly leveled back and not thrown onto the immediate face of the ditch where it will be washed back by rains.

Ample precautions must be taken to keep the line open in the face of drifting snow. Some thought should be given to a permanent remedy in this regard, as well as to temporary remedies. The best plan of snow drift removal is snow drift prevention. Since snow drifts according to well defined laws, these drifts can be controlled largely at will through the proper design and location of wind breaks, snow fences and other forms of protection, which will direct the snow to points where it will interfere least with the operation of trains.

Warning posts should be erected in the vicinity of all crossings, bridges, etc., and, in the case of farm crossings, every effort should be made to remove as many of them as possible during the winter so that the raising and lowering of flanger scoops and the movable points of plows can be reduced to a minimum. This feature, in addition to eliminating the dangers involved in the operation of snow equipment, reduces materially the amount of labor necessary for hand shoveling.

to Every Maintenance Man

Track
Bridges
Buildings
Water Service

At each switch the ballast should be partially removed from the cribs housing the front rods, so there will be no difficulty in throwing the switch as the result of an accumulation of snow and ice. In addition, a broom, equipped with a chisel point on the end of the handle, should be hung on a post at each main line switch, so that trainmen may remove snow from the flangeways and between the stock rail and switch points when necessary, no matter how wet or compacted it may be.

Each section should be supplied with a quantity of coarse salt, and sand or cinders. The salt should be used around switches, flangeways in road crossings, and on platforms, either in its pure state or mixed with the sand or cinders. Sufficient hand scrapers and snow shovels should be supplied for the removal of snow from platforms and switch layouts.

Terminal Problems

While the preparations on outlying divisions are relatively simple and routine in character, those at terminals are varied and extensive. Winter work here involves the removal of snow and ice from about so many different types of buildings and tracks, and complicated switch layouts, often under heavy traffic, that a detailed organization plan is necessary.

Early in the fall, after organization meetings are held, lists should be compiled showing the name, address and telephone number of each employee assigned to snowplows, flanger or spreader service and these lists should be posted with the dispatcher or traffic supervisor so the men can be called when needed with a minimum of delay. In addition, a list of the names of all other employees competent to be used in supervisory capacity should be drawn up. In so far as possible, the regular organization forces should be retained on their own particular territories and should be supplemented by emergency forces only during severe storms.

As on line divisions, the units of snow-fighting equipment, after being overhauled and tested, should be placed at designated points and competent operators should be assigned to them. These units include snowplows, flangers, spreaders with ice-cutting attachments, rapid unloaders and ballast cars equipped with aprons. The mechanical department, in addition, should equip several of the larger locomotives with front-end steam attachments for the operation of the rapid unloaders.

Use Tie Tamper Compressors

One should not overlook the opportunity of making use of maintenance of way track-mounted mechanical units suitable for snow clearing operations, such as tie tamper compressors, which can be employed for blowing snow from the switches in yard, ladder leads, at interlocking plants, etc., and for the removal of ice accumulations at these points. Torches of various types, where available, have been found to be effective in melting snow about slip switches and switch points.

The Spreader Is Considered Indispensable For Cleaning Up Operations on Many Roads

Where steam plants are in close proximity and steam is available, regular snow-melting devices, consisting of coils, should be placed under diamond switches in interlocking plants and between the ties in double-slip switches. Concrete melting pits, employing steam coils, should be gone over to see that the valves are working properly and that the overflow pipe leading to the sewer is not blocked.

Motor units, such as crawler-mounted tractors generally used in welding operations during the summer season, should be equipped with snowplows or snow blades for the plowing or windrowing of the snow from roadways. Light tractors used in baggage or express platform haulage service should be equipped with the necessary attachments to permit their operating rotary brooms, thus eliminating much of the hand shoveling on and about station and yard platforms.

Use Trucks and Tractors

Snow loaders, stationed at various points, enable accumulations of snow to be disposed of efficiently and quickly. Where motor trucks equipped with dump bodies are used to remove snow from yards for disposal in melting vats or on dumps, sufficient units should be arranged for to effect a quick clean-up of the snow while the storm is still in progress.

Sufficient picks and shovels, and also brooms equipped with chisel points on their handles, should be supplied yard and line gangs and placed in charge of the storekeeper or gang foremen, who should issue them and keep a close check upon their return. Salt and sand or cinders should also be supplied to each yard or terminal gang so that it will be in a position to cope immediately with any slippery conditions arising on passenger platforms, walkways, paths along switching leads in yards, or at other points where patrons or employees might fall and be injured.

Camp cars or suitable buildings equipped with stoves should be located at strategic points throughout each terminal area for use by the snow-fighting forces, affording them a place to eat and to warm up during severe

winter storms. Such facilities take much of the hardship out of snow fighting, and have saved the men from many severe frost bites.

One of the most important items in large-scale snow-fighting work, involving as it does the employment of large numbers of men for short periods, is adequate protection of the payrolls. Reputable young men should be employed as checkers to assist gang foremen in making the proper entries on their payrolls, and to distribute identification checks to the laborers.

Where the securing of extra labor for snow-fighting duty is a problem, it is possible, through arrangements with unclassified laborers of long standing, to have them recruit likely candidates in their neighborhoods and to bring them out quickly upon request. Through such an arrangement, each vital point can be protected quickly and effectively by men, who, through past experience, have become familiar with working about the track, and are less likely to be injured than ordinary nondescript labor.

The roadmaster should keep moving from gang to gang and from yard to yard, observing the progress and effectiveness of the operations, reinforcing weak points with additional forces where necessary, and assisting his foremen through counsel and aid to follow out their parts of the snow-fighting program in the most effective manner.

Obviously, in view of the foregoing, to cope with winter storms successfully, it is essential that the officer in charge anticipate them and perfect his organization and equipment well in advance. To have arisen to an emergency is commendable, but to have avoided such an emergency by anticipating and forestalling it is still more commendable.

Water Service Facilities Must Not Be Permitted to Fail During the Winter, Regardless of Conditions

Water Service Men Have Responsibilities

By C. R. KNOWLES

Superintendent Water Service, Illinois Central, Chicago

THE water service departments of the northern roads have a real and serious responsibility in preparing their facilities to give uninterrupted service during the winter months, and unless this responsibility is met, serious consequences can result. On the Illinois Central, this situation is fully recognized, and no facility is overlooked which should be given special attention to enable it to function properly through the coldest winter spells to which it may be subjected.

The Illinois Central operates in territories where the minimum winter temperatures range from 20 deg. above zero in the Gulf states to 50 deg. below zero on its Western lines, although these extremes are rarely reached during normal winters. Obviously, it is necessary to furnish little frost protection in the extreme Southern states. Also, while freezing temperatures are frequently experienced in those states immediately south of the Ohio river, the periods of such low temperatures are of comparatively short duration, with the result that the question of frost protection is not a serious one. On our Northern and Western lines, however, prolonged periods of low temperatures are encountered each winter, making the problem of protecting water service facilities against freezing a serious matter.

Pipe lines may be laid on the surface of the ground without any cover in the extreme southern states. In the central southern states, Kentucky and Tennessee, the cover provided is rarely more than 2 ft., while on our Northern and Western lines, cover is essential, and ranges from 5 to 7 ft. The water station facilities are usually constructed initially to guard against any possibility of interruption to service due to cold weather, and such special protective measures as may be necessary during the winter months are handled as a matter of routine.

Where the pumping equipment, pipe lines and other facilities are so located that they cannot be kept above freezing temperatures, they are thoroughly drained of all water during periods when they are not in use. The larger pumping stations and treating plants are provided with steam or hot-water heat. The heating equipment is thoroughly overhauled and placed in good condition prior to the beginning of winter. At some of the smaller steam plants the fires are kept banked in the boilers and thus provide sufficient heat to prevent freezing, except during extremely low outside temperatures. Automatic pumping stations are provided with automatic electric heaters or oil heaters, which maintain temperatures above freezing.

Frost Boxes

All wood tanks are provided with frost boxes having from one to seven air spaces, which has proved sufficient to prevent freezing under ordinary conditions. However, where the demand for water is not very great, it is necessary to provide heat in the frost box to prevent freezing. Tanks supplied from streams at near-freezing temperature, of course, require more attention than those supplied by the warmer water from wells. Particular attention is also given during the winter to keeping the tanks full of water, or nearly so, since this results in less accumulation of ice within the tank.

All tanks located on our Northern and Western lines are provided with roofs, which offer additional protection against freezing. Furthermore, in some cases, a false floor is placed over the top of the tank at the level of the top of the staves, which provides a dead air space above to the roof. All tank roofs are gone over carefully at the beginning of winter to be sure that they are as nearly air-tight as possible.

The frost boxes of all of our tanks are provided with concrete foundations which extend into the ground below the frost line. On our lines west of Freeport, Ill., where our coldest temperatures are encountered, manure or straw is piled around the frost box at the ground line as an additional precaution against freezing.

Water columns are overhauled prior

to the winter months and their automatic drains are connected up to permit their draining automatically after delivering water. A second water column pit cover, consisting of layers of wood and tarred paper, is installed below the upper cover, with an air space between the two. This second cover is placed approximately 12 in. below the top cover and the space thus provided is filled with manure, straw or other insulating material. The top of the water column pit is then covered with manure or layers of straw which, in turn, is usually covered with dirt or cinders to conserve the heat and to prevent its being blown away.

Arrangements are made with pumping station attendants to maintain continuous fires in stoves or other heating plants during extremely cold weather. This necessitates paying overtime, but it cannot be avoided safely when very low temperatures are anticipated.

All fire hydrants are thoroughly inspected before cold weather. The drains are repaired if necessary, and care is taken to see that the barrel of the hydrant is empty. Many small service connections used only during the summer months for sprinkling and similar purposes, are shut off and drained prior to the winter months to prevent their freezing.

What About Bridges?

By A. E. BECHTELHEIMER

Assistant Bridge Engineer, Chicago & North Western, Chicago

UPON first thought it would seem that there is little to be done to get bridges ready for winter. It is much easier to think of getting heating plants ready for cold weather, or of getting track ready for winter conditions. It may be said, however, that all of our summer's work on bridges is directed toward getting them ready for winter, because there is so much work that must be done on these structures each year that cannot be done economically during the winter months.

Guard Against Run-Off

All waterway openings should be cleared of obstructions and waterway channels should be straightened and improved where necessary to insure rapid and complete run-off during the winter, and especially in the spring when the ground is still frozen. In the range country, dams for water storage for spring and summer grazing should be strengthened and improved to guard against failure in the early spring, with possible flooding or washing out of the tracks.

In many cases, necessary repairs to culverts cannot be made during the winter months because of water and ice conditions. These repairs should, therefore, be made during the summer or fall when waterways are generally dry and when the work can be done to the best advantage. In many cases the substructures of bridges should be repaired and strengthened, and pile bents in channels should be repaired and reinforced to insure that they will be able to withstand the more severe conditions that are likely to exist during the winter and early spring.

The bents for new pile bridges should preferably be driven in most cases before the winter to avoid the much more costly driving after the ground has become frozen. The capping of the bents is sometimes done immediately following the driving, but the framing and placing of the deck timber is often left for the winter months when crews released from the general repair work carried out during the rest of the year can be employed to good advantage on this kind of work.

The painting of steel bridges is generally done during the summer months when conditions are most favorable for this class of work. However, the greatest need for the protective coating applied is during seasons of the year when changing weather conditions are especially favorable to corrosion.

Bridge work involving the disturbance of the track should be completed sufficiently in advance of winter for the track to become fully settled for winter traffic. Following are some of the ordinary jobs which require attention:

(a) The surfacing and tamping of the track at the ends of bridges. Loose track ties at the ends of bridges should be tamped up solid before winter; otherwise the track will be rough and there will be danger of broken rails. Furthermore, loose track at the ends of bridges is very detrimental to the bridges themselves, for they must absorb the added shock and hammer blows resulting as the loads move on to them. This, in turn, generally results in poor line and surface across bridges.

(b) The bulkheads of pile bridges should be repaired or rebuilt before winter, if necessary, to insure that the approach fill will be firm and capable of supporting the track.

(c) The renewal of bridge decks, where deeper ties are used, necessitating a considerable length of run-off, should be done two or three months before winter to allow time for the track to become firm and settled before it freezes.

(d) Bridge filling should ordinarily be done early in the season to allow sufficient time for at least partial settlement of the fill before winter sets in, to insure that the bridge will not be pulled out of line by the fill. After final settlement the next spring, any additional filling required is completed, the old superstructure is removed and the track is ballasted and surfaced. The track is then given close attention throughout the months ahead in an effort to get it ready for the following winter.

Movable Bridges Require Special Consideration to Fit Them For Winter Operation

In cold climates, steel bridge erection, extensive steel repairs and other such classes of bridge work should be programmed for completion before winter sets in to avoid the difficulties and increased hazards concurrent with cold weather. In the case of structures over waterways, this is important also, to insure that the old steelwork or any

falsework used will be cleared from the waterways before late winter or early spring floods occur.

Check Turntables

Turntables shoulde be given special attention as the winter season approaches. Circle rails, table rails and approach tracks should be surfaced and adjusted to correct level and checked for proper clearances. Truck wheels and bearings should be inspected, and, where necessary, adjustments should be made, or the end bearing trucks should be replaced by other trucks which have been overhauled for the purpose. The girder bearings of the trucks should be repaired or reinforced as necessary to eliminate looseness and wear at these important points. Tables should be lifted for inspection and all moving parts should be greased or oiled. New or repaired centers should be installed if necessary. Loading girders and diaphragms showing signs of distress should be repaired or reinforced to give these parts the necessary strength. Laterals, lateral plates and cross-braces reduced in strength by corrosion should be renewed.

Movable Bridges

Movable bridges require considerable attention as winter approaches. At locations where navigation is stopped for the winter, the end rails should be removed and fixed rail installed. These rails should be carefully surfaced. The machinery should be thoroughly greased and oiled for protection during the winter. In some cases the end bearings should be blocked to provide a firm bearing for the end of the span.

Where movable bridges are operated throughout the winter, their end bearings should be adjusted for winter temperatures to insure smooth riding. Failures of end rails by breakage are liable to occur with sudden, severe drops in temperature if proper attention is not given to this adjustment. Careful attention should also be given to the adjustment of the machinery and all other moving parts to make certain that they will act freely under winter conditions. Special attention should be given to the lubrication of shaft bearings, wedges and all moving parts in contact with fixed parts. A thorough check should be made of the primary and auxiliary power units to see that they deliver their full rating, and all electrical devices, such as brakes, limit switches and light indicators should be checked for normal operation.

Where conditions require, storm windows and doors should be provided for the operator's house. Heating plants should be checked and put in good condition, and lastly, arrangement made for the delivery of fuel.

From the above, it is evident that the bridgeman is not without his responsibilities in preparing for winter. Much of his work in this connection should be behind him at this date, but where it is not, it should be given attention without further delay.

Buildings Require Attention

By A. T. HAWK

Engineer of Buildings, Chicago, Rock Island & Pacific, Chicago

SOME phases of preparation for winter in the building field must be started months in advance of the season for which the preparation is being made. Among these are those jobs that are of sufficient magnitude to be included in the annual budget, including the insulation of existing buildings, the renewal of sash in large window areas, as in shops and enginehouses, the replacement of smoke jacks, and other major work. In these cases, the preliminary inspections are made in the late summer or fall preceding the year in which the work is to be done, to give time for the preparation of the necessary plans and estimates for inclusion in the budget.

On the Rock Island all new frame buildings are being insulated, not only as a measure of protection against low temperature, but to conserve fuel. We have also insulated a considerable number of existing frame buildings on our northern lines. In general, the insulation applied to existing buildings has been of the fill type which can be applied without the removal of the exterior and interior wall finishes. The necessity of calking window and door frames in connection with the application of insulation to prevent leakage, cannot be too highly emphasized. Otherwise, a large part of the prospective benefits from the insulation will be nullified.

In general, the preparatory work is of a more routine character, not requiring special authority. Among the more important items in this class is the conditioning of heating equipment. Heating plants should be inspected in the spring before they are shut down, for it is only while they are in operation that leaks can be detected. At this time, all parts needing renewal should be ordered, and as soon as the plant is closed down, it should be thoroughly overhauled. The boiler should be washed out, given a hydrostatic test, and refilled. All firing and combustion spaces, from ash pit to chimney, should be cleaned thoroughly. All valves, pressure and altitude gages, thermometers, water glasses, air vents, etc., should be repacked or tested; and warped or defective grate bars replaced. In the fall, before heat is required, the plant should be inspected again and given a test firing to insure that it is in operative condition. If heat is supplied by stoves, this equipment should be inspected not later than July 1, at which time all repair and replacement parts should be ordered. The

Proper Attention to Buildings Prior to Winter Will Result in Heating Economy and Increased Comfort for Patrons and Employees

stoves should then be gone over and put in first-class shape, including stove pipe, flues, chimneys and floor pans, prior to September 1.

Storm Windows

Where storm windows are in service they should be repaired at the time they are taken down in the spring, and stored in a safe place, preferably in the building they serve. At this time storm doors and storm vestibules should be removed, reconditioned and stored in a similar manner. The question of storage is important for much damage may occur unless windows, doors and vestibule panels are so placed that they will not be disturbed during the storage period. The proper time to apply them in the fall will depend in large measure upon climatic conditions, but the important thing is to have them ready for application, so that there will be no delay by reason of needed repairs.

Again, if storm windows and doors are to be applied to buildings not already equipped, the new items should be completed and fitted well in advance of the time they will be needed. At the time the storm windows and doors are being applied, all door and window fastenings, including locks, hinges, door checks, window catches and sash weights should be repaired so that this work will be out of the way before cold weather arrives.

In those sections where sleet storms are likely to occur during the winter, a supply of sand, or finely crushed rock salt or calcium chloride, should be provided for use on station platforms, walkways and elsewhere where passengers or employees may be endangered by slippery surfaces. It is often impossible to provide safe surfaces for walking in any other way for several hours. While ashes are equally effective, their use is not recommended because they are so easily tracked into buildings and cars.

Likewise all doors and windows in enginehouses and shops should be gone over and placed in good condition during the summer. So far as the renewal of glass in enginehouse windows is concerned, it is often advantageous to schedule this as one of the last jobs of the season, to insure against broken panes upon the arrival of cold weather.

Heating and water lines in enginehouses and shops are usually handled by the water-service forces, but it is important that they be gone over and put in first-class candition well in advance of winter. Heating lines particularly can be repaired during the summer months while they are not in service. Water lines at cinder pits often give considerable trouble during the winter unless they are put in good condition before the ground is frozen. Plumbing and sanitary facilities are also items that should be in first class condition well in advance of the winter season.

Coal chutes, sanding facilities and cinder pits are expensive to maintain where repairs are delayed until cold weather sets in. All work in connection with these facilities should be taken care of during the summer when the men can work comfortably and when traffic is usually lightest.

While roofs may give only minor trouble during periods of low temperature, defects in flashing or drainage, and potential leaks, are certain to make their presence known as soon as thawing begins, particularly where snowfall is heavy. For this reason, all roofs should be inspected early in the spring and necessary repairs should be made during the summer.

These are only a few of the items that affect the comfort of the occupants of buildings. They show, however, that in the building field, preparation for winter must begin months before the approach of cold weather. Because of the large number of buildings and the wide range of work involved, it is impossible to complete this preparation in a limited time just prior to the approach of cold weather.

Men, Materials and Equipment Must Be Ready

By R. S. KNIFFEN

General Roadmaster, Great Northern Railway, Duluth, Minn.

MAINTENANCE of way men on the northern roads must make many preparations to insure uninterrupted train operation during the winter. These preparations should preferably be made prior to November 1. On the Great Northern, rotaries, Russell plows, wedge plows, Jordan spreaders, bulldozers and other snow-handling equipment of this kind are overhauled and stationed at strategic points. Outfit cars are made ready and located at those points where it may be necessary to employ large snow gangs on short notice. Crews are equipped with the necessary snow shovels, brooms and other tools that may be required for winter work. A supply of salt for switches, crossings and platforms is arranged for. Permanent snow fences are repaired, and portable snow fences are repaired and set up. Tumble weeds and drifting rubbish are removed from about the fences to prevent drifts.

The right-of-way should be burned and any heavy weed growth that will not burn should be cut down to prevent drifts; particular attention should be given to snow slopes. It is the practice on some roads to run a Jordan ditcher through cuts in the fall to open up the ditches and to clear off the grass and weeds, making a smooth surface. This permits the snow to blow out of cuts rather than to accumulate in them.

At switches, the ballast is removed from beneath the rods, points, guard rails and spring frogs to allow some accumulation of snow before it interferes with operation, and also to facilitate removal of the snow. Where switch heaters are used, they are made ready for service. Brooms and other tools for cleaning switches are placed at each switch, and for use where heaving track occurs, shims and gage rods are made readily available for use to prevent the necessity for slow orders. Around water tanks and standpipes where water may be spilled, adequate drainage is given special consideration. Where there is a possibility of a heavy accumulation of ice, tie tamping units are equipped with ice-picking tools and are held in readiness for such work. Snow scrapers, teams and tractors are arranged for in advance to clear snow from station platforms, driveways, industry tracks and crossings. It is important that this snow be moved some distance from the track and leveled to prevent an accumulation of drifting snow.

For use about turntables and other places where the snow must be loaded into cars, cranes of various types are arranged for. These machines are equipped with snow clams or with ordinary clam-shell buckets that have been fitted with additional plates to increase their capacity. Caterpillar tractors equipped with bulldozer blades and scrapers are being used, and are very effective in removing heavy drifts. This equipment has also been used effectively for removing cinder piles along the tracks, and for clearing away accumulated dirt and ice around coaling stations, as well as for other similar work.

Current Trends in the Design of Ra

AS the result of the rapid expansion of the railways during the last century, railway officers charged with the design, construction and maintenance of railway buildings have been faced with a continuous and rapid increase in the diversity of their problems. Types of railway equipment, methods of operation, the requirements of the public and the demand for economies have largely controlled the general design of existing buildings. Numerous changes and developments in all of these factors in recent years have brought many new problems which must now be taken into account in meeting current requirements.

Obviously, an essential feature of each particular problem is the desirability of making the most effective use of existing facilities and materials, or, where new construction is required, the planning of layouts and the selection of materials to the end that they will serve the purpose most economically and involve the least yearly maintenance expense. In building work, the best results are obtained only by the most skillful co-ordination of all of the features of any given problem.

Remove Unused Buildings

There are many unused buildings on the railways today, and when it becomes clear that there is no prospect for further economical use of these structures, they should be removed to eliminate maintenance expense, taxes and insurance. Usually these buildings have fallen into disuse because of a change in operating conditions, such as the lengthening of locomotive runs and the consequent abandonment of engine terminals, the closing of stations due to bus and truck competition, and the consolidation of facilities for reasons of economy.

There are also buildings not designed or intended originally for railway use, which were acquired for various reasons, usually in connection with property purchased to permit extensions and improvements and only partly used to meet immediate operating requirements. Some of these buildings can be adapted to commercial uses and leased to industries, thus converting them into traffic-producing facilities. Where such possibility is remote, removal is the best policy. In many cases the salvage value of the materials recovered from such buildings will pay for the cost of dismantling them, particularly in communities where there is a market for second-hand building materials.

In one instance recently, a railway moved the structural frame of a large unused shop building from one city to another to replace a car shop that had been destroyed by fire. I recently had the problem of remodeling an old combination railway station and hotel building, built at a junction point in the days when trains stopped to permit passengers to secure meals. The result of our remodeling is a building which provides alone for the station requirements, with an area of only approximately 10 per cent of the original combined-purpose building.

Opportunities for Modernization

Many of the older buildings that are still required for railway service are lacking numerous items that would be provided quite naturally today in the construction of new buildings. In the case of certain of these structures, where the public is served, such as passenger stations, there is frequently a demand from local or state authorities, or from civic organizations, for their replacement by new buildings. Oftentimes, where the structural condition of the old building justifies, these demands may be satisfied economically by the modernization of the existing structure, both in appearance and in appointments, so that the result will compare favorably with a new building.

The Modernized Interior of a Station Which Was Built in 1892

Many of the older stations were provided with two waiting rooms, and some with a separate men's smoking room. As present-day conditions usually require only one general waiting room, and as smoking is now a generally accepted practice for both sexes without restriction to a special room, the elimination of such rooms will often permit the assignment of the additional space to other necessary activities, precluding an otherwise necessary addition to the building.

One example of modernization that is being brought about as a result of the physical deterioration of the original structure is seen in the arch-roofed train shed, usually spanning many tracks and platforms. Where space permits the installation of columns on platforms, the present accepted method of replacement is with individual umbrella or butterfly-type sheds over each platform.

Equipment Needs Attention

The opportunities for modernization are confined by no means to passenger stations. Structures for all classes of service, and particularly the equipment employed in them, offer many cases where an intelligent approach to the problem will result in increased service life and more economical operation. A few of the many such possibilities are as follows:

Storehouse rearrangement, with the use of steel shelving and bins; the installation of electrically-operated drafting units, pumps and compressors at engine terminals to permit the shutting down of steam

Railway Buildings

By L. P. KIMBALL

Engineer of Buildings, Baltimore & Ohio

A paper presented before the forty-fifth annual convention of the American Railway Bridge and Building Association, in Chicago, on October 19, in which the author presents the many changed conditions in railroading as a challenge to bridge and building men to keep pace; points out many of the current trends in building construction and design; and calls for increased consideration of the newer methods and materials available to the end of producing largely increased effectiveness and economy

boilers, except during the heating season; the installation of modern drop pit tables for unwheeling locomotives in engine houses; the application of automatic burners to heating plants where such action will result in economy of operation; and the changing of center-bearing turntables to the three-point-bearing type to permit the handling of locomotives which cannot be balanced on the old tables.

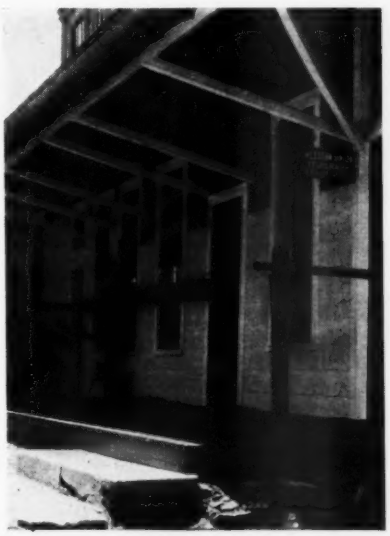
During the last few years the use of electric and Diesel-electric streamlined trains has made it necessary to devise facilities that will provide for the rapid servicing of these units at terminals. The co-ordination of railway and highway services has also, in some instances, made it necessary to adapt existing buildings for use as garages, or to design and build new ones for that purpose. Where pick-up and delivery service is in effect, new freight house construction should take into account the fact that the inbound platform will not require as much floor space as was formerly the case. In the handling of co-ordinated passenger service, it has frequently been found necessary to provide off-line stations for motor bus passengers, with ticket offices, waiting rooms and toilet facilities, and sometimes space for the handling of buses clear of city streets.

Consider Local Conditions

Then, there is a current trend for the adaptation of new buildings to the community in which they are located. This is, of course, true particularly of passenger stations, and is accomplished in the general architectural design and in the interior decoration and appointments. While the construction of new passenger stations has not been extensive in recent years, there are, at least two outstanding examples where this policy was applied very creditably. On the Chesapeake & Ohio, the new passenger station built at Williamsburg, Va., was made to conform in architectural treatment with the restored buildings of this colonial city, and at White River Junction, Vt., the new joint station of the Boston & Maine and the Central Vermont was patterned after the buildings of nearby Dartmouth college.

The present trend toward the increased length of freight cars must be watched carefully for its possible effect on the facilities to be used by them. An example is seen in the increasing number of box cars now in service with an inside length of 50 ft. While dumpers for the handling of cars loaded with grain have come into use only within the last 20 years, none of the dumping equipment built to date can handle 50-ft. cars.

While not a recent trend, the improvement of water station and water treating plants is still an important consideration. With electric power now available generally, savings can be effected by the installation of automatic pumping equipment, particularly at outlying locations. The desirability, or, it might be said, the necessity for installing water treating plants where the character of the water justifies, is generally accepted as good practice. The methods of design and construction of these plants along lines that will insure uniformity of treatment, and thereby maximum benefit, are of large importance.



New Exterior Facing Modernized This Old Freight House

Manufacturers of coal and ash-handling equipment have made available in recent years mechanical units readily adaptable to installations requiring relatively small capacity. These small units can be installed economically at many points where they will provide a substantial saving over present methods of handling.

Air conditioning on the railways as regards buildings has been limited to date, but the railway building engineer has already been confronted with this problem many times in connection with railway-owned hotels, restaurants, and city ticket offices, and there is a distinct possibility that air conditioning will be used in certain passenger stations.

It frequently becomes necessary for building men to adapt a building for use by some outside party as the result of a lease or contract made with the railway. Such problems require careful study and investigation of the user's needs in order to serve his business to the best advantage, but in making any changes of this character, it is important to keep in mind the factor of general availability, so that the building can be used for other purposes in the event of future termination of leases. It is sometimes necessary in these installations to provide cold storage

rooms, air conditioned rooms for special storage and for the ripening of bananas.

New Products Available

Ingenuity and research on the part of manufacturers of all kinds of building materials have resulted in many new and useful products, the number of which is increasing each year. In addition, many of the older products have been refined, improved and made more economical by modern manufacturing methods. One line of material of comparatively recent development is thermal insulation. Another interesting new material that has begun to find its way into railway use is the glass brick or block. Already at least two railways have used them successfully in place of sash in engine houses.

Water Service Facilities Offer Many Opportunities for Improvements

In the sheet metal field there are many other materials, in addition to the conventional copper and galvanized iron, which can be used for similar purposes, including copper-bearing steel, wrought iron, asbestos-protected metal, lead-coated steel, and aluminum and Monel metal.

In the structural line, steel floor units, steel roof decks, special lightweight rolled beams, bar joists, etc., are available for use if required to suit the design under consideration. Rivet-bolts are available which produce a connection of strength equal to that obtainable by the use of hot-driven rivets. These will be found particularly desirable on small jobs where they eliminate the necessity for an organized riveting gang.

Many new methods and materials may be found for roofing purposes, one of the most useful materials being asbestos shingles, which are now available from several manufacturers. Paint manufacturers are continuously improving and diversifying their products.

In the electrical, plumbing and heating industries, the manufacturers are particularly progressive in the development of modern equipment. Necessary illumination of the exterior of many buildings can usually be produced best by modern flood-light units. In the heating of railway buildings, the development of unit heaters and of other such equipment has satisfactorily solved many building heating problems.

In some instances, a little ingenuity will suggest the use of material already available for a purpose not originally contemplated, and in a way to effect a saving in cost.

Treated Timber

The intelligent use of creosoted timber, or of wood treated with other preservatives, deserves careful attention. While the principal use of treated timber on the railways has been confined largely to ties and bridge material, there are many buildings in which this material can be used to good advantage. Creosoted wood blocks, properly installed, make one of the best types of industrial floors.

The problem of the mechanical handling of material is another one occurring frequently in the railway field. The various developments in methods of construction are too numerous to be covered in detail in this general treatment of the subject, but mention is made of concrete prepared at central mixing plants, paint spraying, and the use of welding for both structural assemblies and pipe installations. Structural welding in buildings has been restricted by the building codes of most cities, but since New York and several other important municipalities now permit such welding under suitable restrictions, I am of the opinion that development along this line will become increasingly rapid.

My own reaction, after considering this subject as a whole, and one in which I believe you will concur, is that, while the once rapid development of the railways has been arrested, at least temporarily, we building men must be more alert than ever to use our knowledge and experience to the best advantage of our employers, and that, in the entire railway engineering field, there is no other assignment offering such a diversity of problems as those facing the building engineer.

N. & W. Makes Track Awards

CONTINUING its policy of awarding prizes annually for excellence in track maintenance, the Norfolk & Western has completed its track inspection for 1938, on the basis of which 81 section foremen were awarded cash prizes totaling $2,100 for the favorable condition of the tracks and roadbed on their respective districts. With the prizes amounting to $40, $30, $20 and $10 for first, second, third and fourth places, respectively, the railroad awarded 21 first prizes, 24 second prizes and 18 third and fourth prizes.

This year the condition of the company's tracks continued the improvement that has been noted in recent years, and the average rating for the system, on the basis of 10 as perfect, amounted to 9.30, an improvement of .01 over 1937. In fact, the system rating for 1938 was the highest to be attained since this road first began making annual track inspections more than 40 years ago, thus indicating that the company's tracks were judged to be in better condition than at any time during this period. Further evidence of the generally better maintenance conditions that prevailed in 1938 is contained in the fact that higher ratings as compared with the previous year were given to 18 of the 27 roadmaster's districts.

The Roanoke terminal and the Scioto division, each with a rating of 9.39, tied for first place among the terminals and divisions, while the Norfolk terminal was second with a rating of 9.32. Last year the Roanoke terminal won first honors while the Scioto division was a close second. This year the highest rating (9.42) given to any roadmasters' district, was awarded to the Greggs Hill-Columbus district of the Scioto division.

Among section foremen, W. V. Crosby, Lockbourne, Ohio, and Ernal McCann, Sardinia, Ohio, both of the Scioto division, and S. H. Hughes, of Swords Creek, Va., on the Pocahontas division, all with the rating of 9.48 for their territories, tied for first place for the highest individual rating on the system. Mr. Crosby has been a winner for four years. F. P. Combs, of Rural Retreat, Va., on the Radford division, and A. B. Campbell of Duvalls, Ohio, on the Scioto division, each of whom secured a rating of 9.47, tied for second highest honors among the individual territories.

Electric Switch Heaters

(Continued from page 769)

silver-soldered, which enters a female connection 1⅜ in. in diameter and approximately 4⅛ in. long that completely encloses the terminal contacts. From the heating wire, a monel rod, leads to a contact with the terminal brass insert which is seated in a moulded sleeve within the connection. Where the rubber-covered lead leaves the connection, a separate cap nut and rubber gasket insure a watertight joint.

There are 2 such complete heating units to each turnout, 2 on the movable frog, and 10 on each double slip switch. These units are placed on the gage side of the fixed rails and have proved to be effective in keeping clear of snow an area approximately 7 in. wide on each side of the rail.

A revision of the existing contract under which the local electric utility company supplied power for the Gresham interlocking plant and for the automatic signals and lighting from 91st street (Beverly Hills) to South Chicago, included a provision for serving this installation of switch heaters with 220-volt 3-phase 60-cycle current. The power company installed three 37½-kva. 2300-v./220-v. transformers to step down the high voltage line current, and the 220-volt power is carried to five control boxes from which it is distributed to the heating elements, which are so grouped for control as to balance the three phases of the transformer.

Multiple conductor No. 9 parkway cable sheathed in lead and steel and bedded in the ballast runs from the control boxes to cast-iron junction boxes close to the terminals of the heating units, and from these junction boxes rubber-covered leads, protected by 8-ply ½-in. "squirt hose," extend the short distance to the heater terminal connections. The total power consumption and heat output of the 32 units is 58.35 kilowatts per hour.

Following their installation early in January these switch heaters had one serious test—during the severe snow storms of April 6, 7 and 8. Nine inches of snow fell on the 6th and four inches more on the 8th, while the temperature reached a minimum of 28 deg. The heaters were in operation between 16 and 20 hours a day during this period and provided complete protection for the switches on which they were applied, permitting the regular operation of the interlocking plant without any additional men. The only labor required was that of the signal maintainer, who cleared the operating rods and cleaned around the switch machines at convenient times, approximately once every 24 hours. The power consumed during the month from March 25 to April 25, which included these three days, was only 4,133 kilowatts above the previous normal consumption for the equipment served by that contract, creating an additional power cost by reason of the switch heaters of $124. The savings in labor costs can only be estimated, but, at the standard figure of "a man per switch per day" during storm periods, the road estimates that the annual savings in labor and materials during a normal winter at the Gresham interlocking, including the cost of train delays, will approach $1,500.

The application of these heaters was made by Rock Island forces under the direction of J. P. Zahnen, signal supervisor. With the exception of the transformer poles and transformers, which were installed by the power company at its expense, the cost of installing the 32 heating units, controls and connections was $3,600 for materials and $550 for labor, or between $225 and $250 per switch. Where power circuits are already in, the cost would be materially less.

Making Underwater Inspections

By B. R. Meyers

Assistant Engineer,
Chicago & North Western, Sioux City, Ia.

UNDERWATER inspection of masonry substructures becomes of the highest importance when they reach the age when regular and thorough inspections are advisable; when heavier power is to be operated over them; when the superstructure is to be renewed with heavier spans; or when there are indications that the strength or stability of these structures is questionable. In extreme cases, it may be desirable to construct a cofferdam and unwater it, so that the inspection can be made in detail in a manner approaching that employed for those parts of the structure above the water line. On the other hand, there are a multitude of such structures in excellent condition and of known stability for which underwater inspections are unnecessary.

When approaching a bridge, an inspector should note particularly the line and surface of the track and the condition of the span or tower anchorages, since if there is anything wrong with them it is usually a direct indication of movement of one or more of the substructure units. He should determine by careful soundings whether scouring has occurred which might endanger the pier or abutment.

It is also well to ascertain whether channel conditions have been changed artificially or naturally, both above and below the structure since the last inspection, for channel changes, particularly upstream, may have serious consequences at the bridge.

Care should be exercised to determine whether any of the stone-masonry substructures are failing.

Failures of stones usually occur first at or just below the water line, as a result of frost action and can often be detected during periods of very low water. If the water level is reasonably constant, the necessary information can frequently be obtained by working around the unit in a boat or on a raft, and "feeling" with a long steel bar or hook.

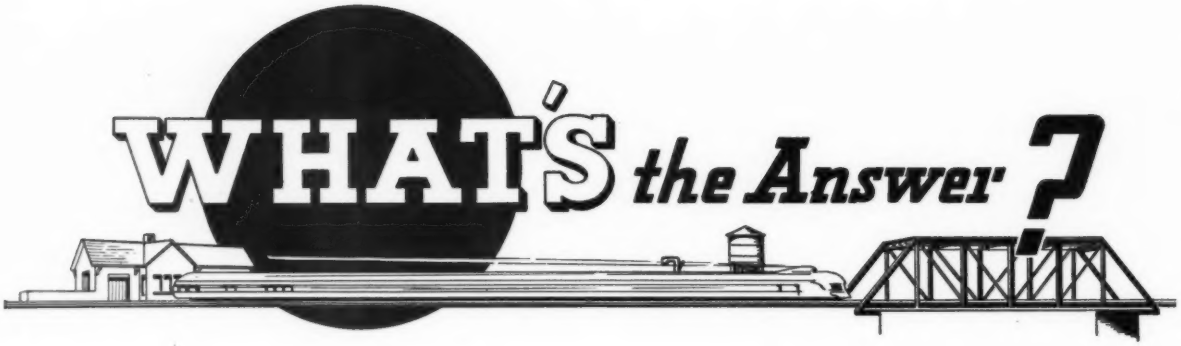
Examination should also be made with suitable tools to determine the condition of the joints in the masonry, as mortars may fail as a result of solution, thus causing considerable loss of strength, and at the same time, encouraging damage from frost action.

The condition of the stones above the water line should be noted, as failure of those in this position, other than those under the bearing which may fail from impact, usually indicate poor stones under water.

If an inspector is a good swimmer and the water is not too swift, he can sometimes make a satisfactory inspection by working slowly around the underwater surfaces of the substructure.

A good method for testing the interior condition of a questionable unit is to drill some test holes through it vertically. These holes can then be used for forcing grout throughout the unit to restore its strength in case it is found to be in weak condition.

As has been mentioned, the inspection of substructures under water is important, and may become most essential. Such inspections should be carefully made by inspectors of considerable experience and of known good judgment.



Design of Flanger Signs

What considerations should govern the design and location of flanger signs?

Must Be Easily Visible

By J. P. Ensign
Assistant Engineer of Track, New York Central, New York

In the past, and this is done even today on some roads, it was the custom to insert a small evergreen tree or an evergreen branch as a marker to denote that the flanger blade should be raised to clear some obstruction, such as grade crossings, switches, frogs, etc. Such a marker usually is cut locally, costs nothing, requires no maintenance, such as painting, storing, renewal, etc., and is easily set in the ground. It is probable that in some localities a marker of this type cannot be excelled, as it is easily visible against a white background and is economical to install.

On roads or divisions where evergreen trees are not readily available, or where traffic is heavy and they are likely to be whipped out by the air currents set up during the passage of trains and thus rendered useless, it becomes necessary to provide more dependable signs. If they are to be located between tracks where there is little clearance, they must of necessity be small. In any event, they should be distinctive, bearing in mind that flangers are operated largely at night and in heavy storms when visibility is poor. For this reason, the sign should be painted a dark color to contrast against the snow. With the growing use of reflector signs, it might be well to consider the use of three or more reflector buttons on each sign, which should be of crystal-white glass. The actual design will vary with the opinion of those who must do the designing, but it should be distinctive. Flanger signs should be located about 75 ft. ahead of the obstruction, to give the operator ample time to lift the flanger blade.

Must Be Distinctive

By M. M. Backus
Assistant Chief Engineer Maintenance of Way, Illinois Central, Chicago

Flanger signs probably were first used to prevent derailment or other damage during the operation of snow plows as a result of tearing out planks in private crossings. Today, we must not only protect the snow-fighting equipment itself, but many accessories that have become a necessary part of or incidental to the track structure.

For many years the standard flanger post on this road has consisted of a white cedar post painted black, upon the top of which is placed a pine board 1¾ in. by 12 in. by 18 in., painted black, with two diagonal white stripes 2 in. wide. This sign is placed 12 ft. from the rail and 10 ft. ahead of the plank to be protected, on the right-hand side of the track. With the flanger sign so placed, and with the black area of the sign showing distinctly against the white background of the snow, the operator of the snow plow is definitely advised as to the location of the obstruction.

As a matter of economy, we have used some metal flanger signs made from scrap boiler flues, flattened at the ends. At the top of the flue, a triangular sign, made from scrap boiler plate, ¼ in. thick, 18 in. wide and 12 in. high, is welded against the flattened tube, the point of the triangle being the top of the sign. This sign receives two coats of paint, the first being red and the second black. We have also considered the use of

Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions you wish to have discussed.

To Be Answered in February

1 *Should section foremen be required or encouraged to ride over their sections on locomotives or trains to determine the riding qualities of their track? If so, how often should this be done? Why?*

2. *Should the grade line in sewers at engine terminals be continuous through manholes, or should it be broken up by a drop to catch sediment and other refuse? Why?*

3. *What are the best species of timber for highway crossing plank? Should they be given preservative treatment? Why?*

4. *Is there any advantage in developing a standard list of tools for bridge gangs? To what extent should this be made applicable to every gang? Why?*

5. *Where snow plows are operated, does the probability of sudden thaws warrant the opening of the ditches after each storm? Why?*

6. *What is the best method of locating and determining the extent of obstructions in water-delivery lines?*

7. *What is the best design of shovel for flanging track, with respect to width of blade and length of handle?*

8. *Should the undercoats of a painting job be harder than the finishing coat? Why? How is this accomplished?*

a scrap boiler flue with a scrap boiler plate, oblong in shape, 18 in. wide and 12 in. high, to be painted black with two diagonal stripes cut into the boiler plate, so that the snow will show through.

In addition to protecting private crossings, some of which are now constructed of scrap rail, and the snow-fighting equipment while it is passing over them, it has now become necessary to include also battery wells, interlocking equipment, rail and flange lubricators, etc. In general, public crossings are readily located without having to rely on the signs. However, if the locations of the crossings as well as of battery wells, interlockings, rail and flange lubricators, etc., are not known definitely by the operators of flangers, snow plows and spreaders, there is an always-present danger that both the equipment and the track and signal accessories will be damaged. The importance of the flanger signs, therefore, becomes self-evident. Because of this importance it becomes necessary that the flanger sign shall be distinctive in design and that it be placed with a definite relation to the obstruction it is intended to protect, and high enough to be above the snow.

Most Important Guide

By District Engineer

During the operation of snow plows and flangers, and of spreaders when engaged in clearing snow, the flanger sign becomes the most important guide for those in responsible charge of these types of equipment. For this reason, it should be of such distinctive design that there will be no chance that it will be confused with other roadway signs, switch stands, etc. Keeping this basic fact in mind, it matters little what the shape may be; in fact, I have observed a great variety of shapes in common use. The next requirement is that it shall be easily visible, that is, the sign itself should be large enough to attract attention and be distinguished when visibility is poor, particularly at night and during periods of storm when the air may be filled with snow. Since it must be seen against a white background of snow, the sign should be dark in color, preferably black or a deep brown. Not infrequently signs of this type must be placed at points where snow drifts deeply, for which reason the supporting post should be of sufficient height to insure that the sign will be visible. The post should also be painted black.

It is highly desirable to have the flanger sign placed far enough in advance of the obstruction it is designed to protect so that the flanger blade can be raised as the flanger car reaches it. This will insure the minimum chance that it will be overlooked.

At the speed at which flangers are usually run, 75 ft. seems to be ample, but to avoid confusion, all signs should be erected at the distance that is selected as the most satisfactory.

Explosives in Deep Wells

Is there any advantage in the use of explosives to increase the flow in deep wells? If so, under what conditions? How can this be done?

Suggests Dry Ice

By E. M. Grime
Engineer of Water Service, Northern Pacific, St. Paul, Minn.

Whether there are advantages in the use of explosives to increase the flow in deep wells will depend almost entirely on the nature of the water-bearing formations. More wells have probably been ruined than improved through the use of explosives, so that it is imperative that where they are to be employed they must be handled only by experienced men and only as a last resort. In some formations, such as soft sandstone or chalk, the explosive may tend to compact the material and hinder the flow. In one case of this kind, an improvement was made by driving several diverging holes in the formation and then discharging shots separately in each. This opened a large cavity and increased the seepage from which the water was derived.

There are limestone or other hard-rock formations where the water comes through crevices, and here the explosive may open other fractures and thus increase the flow. In some basaltic rock structures, the crevices can be enlarged or freed of accumulated silt by the discharge of dynamite. Well casing may be damaged badly or destroyed if it is not pulled back beyond the range of the explosive or even if water is allowed to stand in it where it will receive the disturbance created by the explosive.

Perhaps the safest and most effective way to increase the flow in soft sandstone, at minimum expense, is to resort to dry ice. This will drop at once to the bottom of the well and, as the ice changes rapidly to gas, a high pressure is developed, which forces the water out of the well. As the water rushes in from the rock pores under the influence of the suddenly released head, it is again blown out. There is thus a strong surging action, with alternate pressure and release, which tends to open the pores of the formation and remove fine material which has lodged near the screen or casing perforations. Heavy pressures are developed, but the intensity is not likely to rupture the screen or casing, as may be done with explosives.

Casing May Be Damaged

By C. R. Knowles
Superintendent of Water Service, Illinois Central, Chicago

In the oil fields explosives are used quite commonly to increase the flow from wells, and there is no reason why they cannot be used to increase the flow of water in deep wells, where the conditions are favorable. If the well is in rock, the breaking up or fissuring of the rock increases the area from which the water flows into the well. This is true particularly where the water is drawn from a hard sandstone. If the well is located in limestone or similar formation, the underground water sometimes runs in definite channels, similar to the flow of surface water, instead of percolating slowly as a broad, thick sheet as it does in unconsolidated formations. In this case, the use of explosives should be beneficial and may determine the success of the well.

Although the use of explosives in unconsolidated formations is less common, they are sometimes used to break up cemented or packed sand beds. Extreme care must be exercised, however, where the well is cased to avoid damage to the casing, for unless care is taken, the explosive may do more harm than good. Small charges of 60 per cent dynamite should be used in cased wells, increasing the charge if found necessary. A charge of ½ lb. should be sufficient in unconsolidated formations. Even a charge as small as this should not be exploded inside of a screen. The exploding of a detonator cap alone has been done successfully to loosen the incrustation on a well screen. If the screen is removed and the charge

is placed at a sufficient depth below the end of the casing, larger charges may be used with safety. Gelatin dynamite is well adapted for this use, since it is not affected by water.

In preparing explosives for use in a well, the charge should be placed in a tin tube or protected by other cover that will exclude water. Where small charges are used it is usually found necessary to weight them to insure that they will reach the bottom of the well. Obviously, the charge must be exploded by electricity. The charge should not be lowered into the well by the detonator wire, but by a separate line, to prevent loosening of the cap.

May Be Ruined

By G. S. Crites
Division Engineer, Baltimore & Ohio, Punxsutawney, Pa.

All deep wells cannot be improved by shooting; in fact, some may be ruined. No more water can be obtained from a well than is available to flow into it. If all of the water in the stratum, or strata, from which the supply is obtained is being drained into the well, no more will be available after shooting.

Highly porous sandstones allow a free flow of water, which will seldom be increased by blowing a cavern in them. Fine-grained sandstones are usually low in porosity and the water flows slowly through them. It may be that a given stratum has an abundance of water but that the flow is impeded. Shooting such rock may greatly increase the weeping surface and thereby increase the flow to the well. If, however, the groundwater table is only a little above such a stratum, the flow will be increased only slightly or not at all by the use of explosives. Again, some sandstones continue to disintegrate indefinitely and give off milky water after being jarred and broken by explosives. Sometimes the sand particles from such wells do not settle out readily and the water remains bad for boiler purposes.

For these reasons, one should employ a competent geologist to study the well before deciding to shoot it. If he approves, hire an explosive expert familiar with deep wells to do the shooting. A leaden cartridge of nitroglycerine, or any other high explosive, can play havoc in inexperienced hands. Then trust to luck, for an increased flow may result, provided there is any water to flow.

Investigating Personal Injuries

When personal injuries occur in a maintenance-of-way gang, what steps should be taken to ascertain the cause? Who should conduct the investigation?

Who Is Responsible?

By C. F. Larson
Superintendent of Safety, Missouri Pacific, St. Louis, Mo.

To answer this question we must first ascertain who is responsible for the prevention of personal injuries in maintenance-of-way gangs. Usually this is the division engineer who is charged with safety education and with creating safety consciousness in the minds of the workers under his jurisdiction. The first step is that of insisting that the roadmasters be fully advised and educated in matters pertaining to safety and to efficiency in the performance of work over which they have direct supervision. The track foreman receives his direction from the roadmaster; the bridge and building foreman gets his from the supervisor of bridges and buildings, who reports to and receives his instructions from the division engineer.

When an accident occurs, which results in a personal injury to one or more employees, the foreman in charge reports it immediately to his superior officer, the roadmaster or the supervisor, who directs and conducts the investigation at the scene of the accident. When all of the facts have been ascertained, the officer conducting the investigation makes a complete report of the findings, which is transmitted to the division engineer for his review, approval or criticism, before it is passed on to the superintendent. If the accident is of a serious character, the division engineer should personally make the investigation.

In ascertaining the facts connected with the injury or injuries, every man in the gang should be interviewed. If any member of the gang says that he knows nothing about the case, this statement should be committed to writing, and all statements from employees, signed by those who make them. The value of negative statements is great, if afterwards, the persons making them claim to know some or all of the facts leading up to or connected directly with the injury.

Up to this point the action of maintenance officers has been discussed. Obviously, the claim agent has a deep interest in all personal injuries, as well as in the investigations. In fact, if the case is a serious one, the claim agent should participate in the investigation, writing out the statement of each employee as he testifies.

What is the value of a post mortem investigation and to what use is it put? If the knowledge gained through the investigation is not passed on to other employees on the division or system in such a way that it will be helpful to them, it has little value. If, on the other hand, the facts teach a lesson that should be known on a system-wide scale, an educational letter should be prepared by the proper officer, setting out what happened, how it happened, why it happened and how it could have been avoided. These educational letters should be distributed to all superintendents for their use in spreading safety knowledge.

Why should there be personal injuries in maintenance-of-way gangs? Generally these gangs are isolated far from headquarters and of themselves are not in touch with what is transpiring elsewhere. Many of the larger gangs are recruited by labor agencies from centers where unemployed men congregate. They are employed seasonally for the larger track-maintenance operations, such as laying rail, ballasting, renewing ties, surfacing, etc. It is in such gangs that the heaviest toll of accidents occurs. The stable section gang is generally a safe gang.

Leadership of the best and highest capacity is an essential to the inculcating of safe habits in men of this type. This returns to the officers who are responsible for accident prevention through effective leadership—the division engineer and the roadmaster. The ability to estimate the capabilities of men and thus pick good subordinates is one of the important qualifications of leadership. Many a man has achieved success largely through his ability to surround himself with capable and loyal subordinates. The responsibility of the leader does not stop with the giving of orders; he must follow them up to see that they are executed properly and accept no excuses for failure to execute them.

Training workmen in safe ideas, that is, the proper attitude toward safety, is a matter of presenting the subject in such a way that there will be a safety response. An essential in safety training includes the estab-

lishment of a bond of sympathy and mutual understanding between the supervisory forces and the workmen; without this relationship any attempt to gain a favorable response to educational efforts will fail. This discussion has gone far afield from the specific question, but the course it has taken has been prompted by the thought that if a safety program is successful, there will be fewer cases to be investigated, while the investigations that become necessary will be on an entirely different basis from those where the supervisory forces are more or less indifferent to safety work and, therefore somewhat lax.

Supervisor Investigates

By Division Engineer

When personal injuries occur in maintenance-of-way gangs, after getting the injured person to the doctor, the foreman should report the case to his supervisor immediately. The supervisor should then, as quickly as practicable, make an investigation on the ground to determine the cause of the accident, restoring the conditions preceding, and re-enacting as nearly as possibly the events that led up to the accident. In some cases, it has been found necessary to wait until the injured man has returned to work before all of the facts as to the real cause of the injury are obtained.

It is desirable for the supervisor to make this investigation, particularly as it may be that it has involved the use of tools that should not have been used. In this case, the foreman's responsibility can be determined quickly. Our supervisors are very zealous in following up, ferreting out and analyzing the causes of those accidents that occur under their jurisdictions, so that they can advertise to their men the conditions that lead up to every injury, in order that they may be alert to eliminate any similar conditions that may exist in their gangs, as well as to keep the safety idea constantly before them.

Rail Damage in Handling

In what ways do rails become damaged in handling? What are the results? How can this be prevented?

Result of Carelessness

By Division Engineer

There is no excuse for damaging rail in handling. With rare exceptions any form of damage that occurs during the process of handling is a direct result of carelessness. In view of the almost universal use of cranes, resort to hand methods in unloading cannot be justified on any grounds. For years before such equipment was available it was the general practice to unload rail by hand, and many men became quite expert in doing so; yet rails were damaged with a frequency that could not be tolerated today. Dropping a rail so that one end will strike the ground first is almost sure to result in a bent rail. Dropping a rail from the car floor level onto the roadbed will also bend it if there is a "hard spot" in the shoulder at any point in the length of the rail. If it falls on a tie or a stone or any other hard substance the result will be the same.

Even where the unloading is done carefully with a crane, damage can occur if the rail is not supported properly and with reasonable uniformity throughout its length. For this reason, rails should never be allowed to lay across ties, other rails or with one end on the ballast shoulder while the other end is on the roadbed, with a considerable portion unsupported. I have seen rails take a permanent set from such usage.

When spiking, fitting joint bars or doing other work that requires a slight shift in the position of the rail, the flange or web should not be struck with a maul or sledge. I have seen many broken rails that could be traced to blows for the purpose of moving the rail slightly. The safe way is to use a bar, making the shift under pressure from this tool.

Probably the next most common cause of damaged rail is the manner of laying it. This includes unequal expansion, and too much or too little expansion; failure to have every tie give its full quota of support before trains are allowed to pass over the new rail; lack of proper anchorage and insufficient anchorage; improper application of joint bars, and failure to keep bolts tight as the bars continue to get their set to the rail under traffic. It is important that the rails all have the same cant when laid and after they have made full settlement on the ties, for otherwise wear on the running surface will be irregular.

New rail should always be lined; otherwise there will be irregular wear on the gage side of the head, where there should be no wear on tangents. Not many years ago sharp accurate lining was almost universal, but general observation today indicates that on not a few roads sharp lining is becoming a lost art. In some degree this has resulted from the wider running surface of the heavier rail, and the difficulty of lining has been increased by the canting of the rail, which gives the wheels a better coverage of the rail head. For this reason, I favor the use of a lining transit.

Rails May Be Kinked

By L. D. Gardner
Roadmaster, St. Louis-San Francisco, Poplar Bluff, Mo.

When rails are rolled off cars with shovels or bars and allowed to fall on the shoulder of the roadbed, there is an ever-present danger that they will be kinked. These kinks are generally bad, for they are usually short. In addition to the possibility of bending the rail, this method of unloading is not safe and should be prohibited, because there is great danger of personal injuries. New rail should always be set off with a power crane. Before the rail is unloaded all ties should be moved out of the way so that the rail will lay flat. New rails should never be permitted to strike or lie across each other.

The best way to unload material on a rail-renewal job is to place the rail cars in the front of the work train, with the smaller material in the rear. This permits the rail to be unloaded first on a clean shoulder, and the remainder of the items can be unloaded as the train progresses, without interfering with the rail. If the work is properly organized, all of the material, including the rail, can be unloaded with a gang of 28 men. By careful supervision, the unloading can be done uniformly, so that later when the rail is being laid there will be no necessity for hauling any of the material forward or back to the gang to fill out gaps where there is no material.

New rail is, or should always be, surfaced and the ties spaced immedi-

ately behind the rail gang, to prevent the occurrence of surface kinks. New ties for this work should not be unloaded until all of the released track material has been picked up. A good way to do this is to place the tie cars at the rear of the work train, so that the ties can be unloaded immediately after the released track material has been completely picked up.

Who Should Place Shims

Where the track heaves at the end of an open-deck bridge, should the section forces be allowed to place shims on the bridge, or should a slow order be placed until bridgemen can get to the structure? Why?

Suggests Drainage

By Division Engineer

Thoroughly dry ground does not heave, and this problem can be practically, if not entirely, eliminated by drainage of the embankment at the ends of bridges. In fact, drainage of our embankments has made heaving only a minor problem. If, however, the track at the end of a bridge does heave, I would not hesitate to allow the section forces to do the shimming. With the present requirement that full speed must be maintained at all times, it is necessary that the shimming be done by the section forces, for it is often impossible to bring bridgemen from some distant point to do the work.

On the other hand, heaving seldom reaches its maximum at once, and if thick shims are needed, there is usually time to get a competent bridgeman on the ground by the time they are needed. In any event, the foreman should report the case as quickly as possible so that the bridge forces can check up on his work. A foreman who is competent to apply shims elsewhere should be competent to do light shimming at the bridge ends. If high shims are needed, however, I believe that a representative of the bridge department should be on hand to supervise the job.

Favors Section Gang

By District Engineer

Some years ago I was employed on a road which did not allow the section forces to do any work on bridges, unless the bridge and building supervisor or a competent bridge foreman was present. We had much trouble with heaving, and when this occurred at the end of a bridge there was always considerable delay in getting a bridge gang on the ground. In the meantime, we were compelled to operate under a slow order. Later I went to another road which did not prohibit shimming by the section forces and we always allowed them to do so when necessary. As we had considerable of this work, I required foremen to report every case as soon as they could get to a telegraph office, and I detailed an experienced bridgeman to inspect the bridges as soon as he could get to them.

I found, however, that there is considerable difference in section foremen with respect to their ability to do a good job, and we had to do some educational work, but the plan was successful and we never had any unsafe conditions. If shims more than ½ in. thick were required, we used gage rods to reduce the number of rail braces necessary and thus reduce the damage to the bridge ties, as a result of excessive spiking. This is a particularly important point, for the track off the bridge may not always remain level.

Paint for Enginehouses

What types of paint or other coatings give the best protection to wood and steel surfaces in enginehouses?

Not Yet Settled

By General Inspector of Buildings

Despite the fact that much time and study have been given to the problem presented in the question, no complete solution has been worked out. Experience has shown that certain pigments in linseed oil, such as lampblack, red oxide, graphite and barium sulphate, do not afford protection against enginehouse gases when applied directly to iron and steel surfaces; in fact, some or all of them seem to accelerate corrosion. For this reason, they should never be applied directly to such surfaces.

On the other hand, these paints have given excellent results when used as finishing coats over priming coats which contain rust inhibitors, such as red lead, blue lead and zinc compounds. In some cases bitumen paints have produced good results, but I do not consider them very satisfactory because of the tendency to alligator. I prefer the normal type of paint, using pigments that are either actual inhibitors or that are inert to both the metal and the gases with which they come in contact.

Wood surfaces in enginehouses present a somewhat different problem, since the wood itself is affected by the moisture that is often so prevalent in such buildings. In many cases no protective coating is applied to such structural members as posts, beams, purlins, sheathing, etc., except cold water paints to improve the interior lighting. In these cases, painting of wood surfaces is confined to doors, windows and their frames. The reason for this is that the alternate swelling and shrinkage of the wood as a result of varying moisture conditions causes the paint to curl and peel from the surface in so short a time that it has little protective value, and the application of paint that will not stick to a surface is an economic waste.

Creosote Best Protection

By Supervisor of Bridges and Buildings

This was an old problem when I entered railway service and it is still with us, despite the fact that conditions in enginehouses are far better than they were then, largely by reason of better building design. I have never found any paint that will give protection to iron and steel surfaces for any length of time under the severe conditions that are found in enginehouses, although some paints are better than others.

If red lead is applied as a priming coat to a clean surface and is covered with two coats of finishing paint having an inert pigment, that is, that is not affected by sulphurous gases, the protective value will be at its maximum. It should be understood, however, that these gases will attack the vehicle, generally linseed oil, and cause failure through destruction of the vehicle.

I have tried coal-tar and asphalt paints and compounds, but they alli-

gator and may be difficult to remove. So long as they remain intact, however, they afford excellent protection. I have come to the conclusion through long experience, that it is a waste of time to apply ordinary paint by the usual painting methods to iron and steel surfaces in enginehouses.

In recent years certain rust inhibitors have become available, which afford far better protection than paint. Where the metal remains cold they can be applied to the surface and have the advantage that paint can be applied over them. It is true that the appearance is not as good as that of of a job in which nothing but paint has been used, that is, when the paint is new, but after it has begun to fail, there is not much choice between the appearance of the two.

No good purpose is served in painting the posts and roof members, or any other wood parts of engine houses except doors, windows and their frames, for the life of the paint is so short that both the material and the labor of application become sheer waste. Yet the wood is readily attacked by the locomotive gases and deteriorates quite rapidly. This action is much slower around doors and windows, however, because more fresh air circulates around these openings, keeping the gases at these points at a much lower concentration, so that the paint lasts longer and reduces the rate of deterioration of both the metal and the wood.

I have found that a thorough job of creosoting will protect the structural members of the house better than any protective coating applied to the surface. A number of years ago I was transferred to another division, and a few weeks later the entire roof of a 24-stall enginehouse collapsed. Investigation showed that the timber had been practically destroyed by gas action, although the members had retained their full cross section and appeared to casual observation to be in good condition. Although this building was only about 15 years old, the design was such that ventilation was poor. In the meantime, traffic had increased to the point where the facilities were crowded and the house was always full of locomotives, several of which were being fired up constantly. In this case the failure of a single member had carried the entire roof down with it.

Instead of merely replacing the roof, a larger enginehouse of better design was constructed, with improved ventilation. It was also decided to use creosoted timber for the posts and roof, and today, after 22 years, the timbers are sound, showing no signs of deterioration, indicating quite clearly that this form of treatment affords protection against gases as well as against decay.

The failure of this roof led to an inspection of three other large enginehouses on the division, having 18, 30 and 40 stalls respectively. Two of these were only a few years old and were in good condition. The third was much older, the roof timbers being carried in stirrups. While deterioration of the wood in this latter structure had not yet progressed to the point of failure, most of the stirrups had practically reached this point and it became necessary to shore the roof at once. The roof and posts were renewed with creosoted material and they are today in excellent condition after 21 years.

Cutting Out Rivets

How does one go about cutting out rivets with an acetylene torch in steel bridges? Is this good practice?

It Is Good Practice

By G. A. Haggander
Bridge Engineer, Chicago, Burlington & Quincy, Chicago

Up to a few years ago the manufacturers of cutting torches produced only one kind of cutting tip, which was designed to burn steel by penetrating deeply. After preheating to a combustible temperature, the oxygen was released through an orifice at high velocity and over a small area, usually $\frac{1}{16}$ in. or less. It was possible to reduce the penetrating blast by a slight pressure on the cutting trigger, and a skillful operator, by using great care, was able to cut a rivet head off cleanly, without nicking the plate retaining the rivet.

However, many operators of cutting torches were unable to acquire the skill necessary to do this, with the result that they often left streaks of severely gouged-out plate material around the rivet holes. Such scarred areas did not permit tight rivets in replacement. In addition, a certain amount of concentrated stresses were set up during the loading period. Even though the rivet heads were cut successfully with this type of tip, the backout tools had to be held on the rivet because of the slight projections on the cut surface of the rivet.

More lately, the development of the low-velocity rivet tip has been a great step forward, for it permits just enough oxygen to be directed on the top of the rivet head to continue combustion and wash the oxidized metal away until the shank is reached. The burning is at such a rate that the steel plate does not reach the temperature of combustion, for which reason, in most ordinary cutting operations, it is practically impossible to destroy a plate from which a rivet is to be renewed. Upon the completion of the burning of the head with this type of tip, there is a concave pit in the shank of the rivet, which provides an ideal guide for a backout tool.

The low-velocity cutting tip is probably the most nearly fool-proof tool of its kind that has ever been developed; the looser the rivet is, the easier it is to remove. I consider it good practice to cut out rivets with this kind of an acetylene torch.

Two Practical Methods

By C. A. Daley
Maintenance of Way Engineer, Air Reduction Sales Company, New York

There are two practical methods of removing rivet heads. One involves the use of the standard bent cutting tip which removes the rivet head but gives no consideration to the damage that may be done to the plates, as when the bridge is to be scrapped. In this case, the torch is held normal, or nearly so to the rivet head. The other and better method is to use a special rivet-cutting tip which, when applied, washes the rivet head off, including about one inch of the shank, without injuring the plate. To do this the torch is held normal to the plate and the flame is directed on the top of the rivet head. Both methods are practical and both are widely used, but the second is adapted particularly for dismantling for salvage and where the rivet is merely to be replaced.

The following data apply to the process of washing or burning buttonhead or conical-head rivets completely by applying the torch flame to the center of the head and pointing it to the center line of the rivet shank. These data are based on our own equipment and on actual performance. As different sizes of rivets require slightly different rates of delivery of the gases, special care should be exercised to insure that the right tip is selected for the rivets to be cut.

Rivets 5/8 in. in diameter can be cut at the rate of 300 to 360 an hour, with an hourly consumption of 225 cu. ft. of oxygen and 45 cu. ft. of acetylene, including the preheating oxygen. The pressure should be: Oxygen—20 to 25 lb.; Acetylene—4 lb.

Rivets 3/4 in. in diameter can be cut at the rate of 270 to 300 an hour, with a consumption of 350 cu. ft. of oxygen and 45 to 50 cu. ft. of acetylene, including preheating. The pressure should be: Oxygen—40 to 45 lb.; Acetylene—4½ lb.

The rate for 7/8 in. rivets is 240 to 270 an hour; the oxygen consumption is 450 cu. ft. an hour and that of the acetylene 50 to 55 cu. ft., including the preheating oxygen. The pressure should be: Oxygen—45 to 50 lb.; Acetylene—5 lb.

Diagonal Sheathing for Buildings

Under what conditions is it desirable to apply diagonal sheathing in frame buildings? What are the advantages? The disadvantages?

Seldom Done

By Engineer of Buildings

We have rarely resorted to the use of diagonal sheathing, although sheathing of this type has been employed on towers superimposed on frame buildings. The purpose of this form of construction is to increase the resistance of the structure to heavy wind pressures, and there is no doubt that in a windy country the use of diagonal sheathing is of distinct advantage. Most small railway buildings do not have the resistance to heavy wind pressures that they should. The corner posts are frequently of the same size as the remainder of the wall studding or at most they are made up of two studding, generally 2 in. by 4 in., nailed together and without bracing. A building of this design with horizontal sheathing is easily forced out of plumb if it is subjected to unusual horizontal pressure.

These defects are accentuated when buildings are constructed of green or only partly seasoned timber. Tests have shown that horizontally sheathed buildings lose as much as 40 per cent of their original rigidity by the time the lumber is thoroughly died. Possibly this is not altogether due to the shrinkage of the lumber and probably most buildings are not affected to this extent, but there is no question that there is considerable loss of rigidity where green lumber and horizontal sheathing have been used in building the structure.

Where a building is rectangular in shape or where the door and window openings represent a considerable percentage of the wall space, it is scarcely debatable that there is a distinct advantage in the use of diagonal sheathing. On the other hand, plaster applied to wood lath adds greatly to the rigidity of any frame building. In fact, in many cases the stiffness of the lath and plaster is greater than that of the horizontal sheathing. If let-in braces are applied around door and window openings a further increase in stiffness, that is, resistance to horizontal thrusts and vibration, can be obtained. It should not be overlooked in this connection, however, that plaster cracks will develop far more quickly, that is, with thrusts of smaller magnitude, when door and window openings occur in either outside walls or partitions.

This brings up the question of the use of the braced timber frame that was an important feature of the frame buildings during pioneer days. These buildings probably had greater rigidity than was necessary; yet many of them are still standing, while many of those of later construction and less rigidity are gone, indicating that rigidity and permanence are related in a way that cannot be ignored.

Favors Its Use

By District Engineer

Diagonal sheathing is little used in railway buildings, but when one considers the vast investment, aggregating $1,680,000,000, that the railways of the United States and Canada have in buildings, and the further fact that most of them are of frame construction, the advantage of adding to their permanence by adding to their rigidity, if this can be done within reasonable cost, seems obvious. Most building engineers with whom I have talked take the position that there is no justification for the use of diagonal sheathing in the general run of railway buildings. The local building forces oppose it because it is more difficult to apply and there is considerable waste of material, for which reasons, they say, the cost of the structure is increased.

Most railway frame buildings, except some of the older ones, have relatively light framing and no bracing against the horizontal thrust produced by strong winds. Horizontal sheathing adds something to the rigidity of the frame, but as compared with diagonal sheathing this is small, the ratio being about 1 to 7 or 8. It is also true that wood lath and plaster add greatly to the rigidity, sometimes more than can be obtained by diagonal sheathing alone. In fact, this form of wall finish may provide ample rigidity for all normal purposes; yet plaster cracks from shrinkage, from settlement, from the vibration of passing trains, and sometimes from the thrust of very high winds, so that eventually the sheathing comes more and more into play, and finally becomes the most important factor in preventing the building from getting out of plumb or out of its original line.

Again where there are many or large door and window openings the resistance of the walls against horizontal thrust is greatly weakened. Every building maintenance officer is familiar with the tendency of plaster walls to crack around window and door openings. What most of them do not know is that diagonal sheathing will reduce this tendency, for it requires a thrust about 10 times as great to produce movement in a plastered wall having diagonal sheathing as it does in one having horizontal sheathing.

Two of the reasons why diagonal sheathing is not used to any extent in railway buildings have been mentioned. So far as the increased cost is concerned, this is a relatively minor matter, for only the cost of the sheathing is increased and with few exceptions this should not be greater than 15 per cent, so that the total cost of the building is affected only slightly.

The number and size of the nails used in applying the sheathing are important. In horizontal sheathing three nails create no greater stiffness than two, while four nails increase the stiffness by about 40 per cent, compared with two. With diagonal sheathing, three and four nails increase the stiffness of the wall about 4.5 to 7.5 per cent, respectively, compared with two nails. In this case, however, the size of the nails determines the magnitude of the thrust at which failure will occur, since with diagonal sheathing the nails fail first by bending and twisting before the wood splits.

New and Improved Products

Frame Support for Sawing Machine

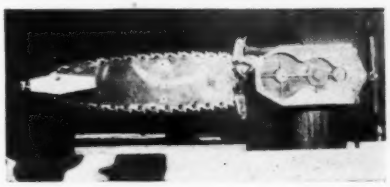
THE Reed-Prentice Corporation, Worcester, Mass., is marketing a new adjustable frame support for its chain-type portable timber sawing machine, which, while simple in itself, is said to add materially to the effectiveness and safety of the machine when cutting off piling. The support, used in conjunction with metal guide plate attachments to the ends of the saw, is designed to be used instead of free-hand sawing, or sawing with the aid of timber guides, which frequently present difficulties both in the sawing operations themselves and in obtaining the most accurate results.

The new support consists essentially of four lengths of square hollow steel tubing, which can be single-bolted together near their ends through a series of holes provided, to form a supporting frame in the shape of a parallelogram of any angle to carry the opposite ends of the saw. This frame, when set on guide timbers spiked to opposite sides of the piling to be cut, offers a true guiding surface for the saw in the exact plane of the

Employing the Saw-Supporting Frame Insures Largely Increased Accuracy

cut desired. The guide plates attached to the saw are merely flat-faced aluminum castings, one of special shape, which is attached to the gear housing at the motor end, while the other is essentially a flat plate which is attached to the light handle end.

The adjustable feature of the frame as to width, and the ability to collapse it into a diamond shape of any angle adapt it for use where close or irregular spacing of piles is involved, while the bolted connections make it



A Side View of the Saw Showing the Aluminum Supporting Plates

possible to open one end for mounting about piles where the frame cannot be slipped over the top.

In affording a smooth guiding plane for the saw, the frame makes sawing operations easier, faster and safer, and insures more accurate work. Employing the frame, it is said that a whole series of piles in rows or bents can be cut to provide a full bearing for cap timbers. It is said also that through the frame the maneuverability of the saw is increased considerably, permitting it to be swung at the most advantageous angle for cutting in close quarters between piles. It is obvious that by employing the frame in conjunction with the guide timbers spiked to the sides of the piling, there is no mutilation of the guide timbers by the saw teeth, with consequent inaccuracy in the cutting plane, as is the case so generally where guide timbers alone are used.

Offers Improved Joint Packing Service

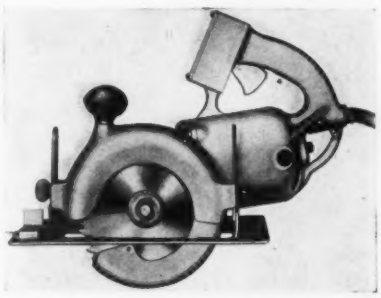
THE Rail Joint Company, Inc., New York, has taken over the sales of the rail joint packing service, including the packing compound, which has been made available to the railways in the past by the Railway Maintenance Corporation, Pittsburgh, Pa. This service, which has been improved and expanded, both as regards equipment and material since it was first offered in 1930, now offers both track-mounted and off-track equipment for applying the material behind the joint bars. In either case, the material, an asphalt-base oil—wood flour compound, is applied under high pressure, completely filling the space behind the bars. The compound not only excludes moisture and other corroding elements from the rail ends within the limits of the bars, but has high rust-inhibiting qualities and acts as a lubricant to prevent "frozen" joints. Through the latter quality, it is said that greater uniformity of joint openings is thereby maintained, with consequent minimized rail end batter and reduced joint maintenance.

Both types of packing machines, mounted on a rail-type car or on a tractor, can pack joints at the rate of approximately 150 an hour. To date, this service, employing both types of equipment, has been used by a number of roads, one road having packed approximately 90,000 joints during 1936 and 1937.

A detailed description of the earlier part of the work on this road appeared in *Railway Engineering and Maintenance* for July, 1937.

New "High Torque" Portable Electric Saw

A NEW portable electric saw with 2-in. cutting capacity, weighing 18 lb. and designed for one-hand operation, has been added to the line of



Side View of the New Portable "High Torque" Electric Saw

portable electric tools manufactured by the Syntron Company, Homer City, Pa. The saw, which is equipped with an oversize universal motor, has a tilting base for making bevel cuts; an underwriters' approved trigger switch; silent worm-gear drive; and an automatic telescoping safety guard. It is supplied with a 6½-in. diameter combination rip and cross cut saw blade but it can also be furnished with abrasive discs for slotting brick, tile, etc. The saw is said to be of rugged construction and able to withstand severe service. It is also claimed that as a result of its excessive-powered motor and its gear design, the saw has unusually high rotating operating torque.

What Our Readers Think

Rail Wear and Joint Batter

Leeds, Ala.

To the Editor:

I have noticed that quite a bit of interest is being taken in the subject of rail wear and joint batter, as has been evidenced by several letters to the editor, and that some remedies have been suggested that appear to be good. I have been very much interested in the information contained in these letters. I believe that the trackman has a right to know definitely the reasons why his rail is wearing unduly. The experienced trackman often can offer a remedy that will at least decrease the rate of wear and thus prolong the life of the rail.

I know that I gathered considerable information as to the causes of wear and tear on tracks, rail and equipment, during my 30 years of active service as a track supervisor, and my case is no exception, for many others have done likewise. My personal experience has been confined to a single-track main line in mountain territory, laid principally with 90-lb. A.R.A.-A, open-hearth rail. On such a line it is difficult to maintain elevation on curves that will be suitable for both high-speed passenger trains and slow-moving freight trains. For this reason, whatever elevation is established must of necesisty be a compromise, but one that generally results in heavy side wear on the head of the high rail and in mashing and flow of the metal in the head of the low rail. If, however, the line is double-track we are able to elevate the curves in a manner that is more nearly suited to the speeds on the respective tracks and thus reduce wear, particularly on the low rail.

I have observed that the best results are obtained on curves where the gage is kept to standard at all times, and where the rail is maintained in such a position that the treads of the wheels find a full bearing on the running surface; if the gage is not widened the tread will cover the full width of the rail head. If the gage is widened, the rough surface of the outer part of the wheel will bear on the rail, while false flanges will also find a bearing on the running surface; both tend to produce excessive wear and flow of metal on both rails.

It is my observation that curve wear on the high rail is caused in large measure by the flange of the first driver, a relatively small amount being caused by friction of the car wheels, although this of itself is no inconsiderable matter. More wear occurs where six-wheel trucks comprise a considerable proportion of the wheels passing over the track than where all cars have four-wheel trucks. Obviously, curve wear can be greatly reduced through the use of rail and flange oilers, several makes of which are now on the market. Although this device has little or no effect on the low rail.

J. Morgan,
Retired Supervisor,
Central of Georgia.

Some Weeds

[The following letter, addressed to a branch line roadmaster by the conductor of a local freight train on that line, affords a commentary on conditions on many lines today.—Editor]

After making a round trip on the "local" from ——— to ——— on August 5 and 6, I am in a position to give you a full report on the success of our railroad's efforts at weed conservation, as practiced on your division.

On the two dates mentioned I had the two shortest brakemen to be had who, although possibly classified as mental giants, have attained a stature of only about five feet. While switching at most of the stations on this territory, they are far shorter than the average weed; this often resulted in their getting lost while working along the house tracks, doing station switching, etc.

When we recalled our flagman, it was necessary for him to climb up on the caboose so we could see him. At first I had him wave his red flag over the tops of the weeds, but after we took signals from a civil engineer on a surveying crew a couple of times, I had to insist that he climb to the cupola of the caboose so we would know it was our flagman.

Working with the head brakeman was still more difficult. Each time that he wished to give a signal he had to climb at least half way up a box car before he could be seen. He disappeared for several minutes at a time, completely lost in the jungle. At intervals we tooted the whistle to help him get his bearings, for, like Corrigan, he had no compass. You can imagine the effect on the astounded public when a short, fat brakeman suddenly came bounding out of a patch of tall weeds, scampered half way up a box car, screeching and bellowing, and frantically waved his arms in mystic signals to let the rest of the crew know that he was back on the job.

I had my own troubles, believe it or not. At first I was determined to turn those two short brakemen in for a pair of tall ones; then I decided that it was not their fault that their parents brought them up in a short grass country where they could see over the tops of ordinary vegetation.

At one time I thought that I could stretch my neck over the weeds far enough to see what was going on, but at my age the elasticity of my neck seems to have deserted me and that method would not work. I then tried pulling the taller weeds around each switch stand but they seem to be set in concrete and I could not budge them. Then a section foreman told me that it was against the rules to pull those weeds until times got better. At that I gave up in a manner befitting a conductor.

I do not believe in critics if they have nothing to offer, so I make a few suggestions.

How about a wage cut of 15 per cent, the money to be used to hire weed cutters and the rate to be restored when the weeds are all cut?

How about the company furnishing stilts for brakemen?

How about discharging all runt or pint-size brakemen and hiring tall ones?

How about hanging each section foreman to the tallest weed on his section and the roadmaster to the tallest weed on the division, provided they are furnished money and men to cut weeds with and do not do so?

Hoping the above gives you a good idea of the results of weed conservation in your territory, I remain

Weedily yours,
I. M. Weedy.

P. S.—I am transferring to another run where I won't have to switch at each station, but I would like to have some figures on the probable time of the first killing frost, and also some information as to when we can expect the weeds to be blown down to the level of an average man, for at that time I expect to take a local run again—but not until then.—I. M. W.

NEWS of the Month

Board Feet—Not Cubic Feet

In the article entitled "Preframed Transfer Bridges on the Baltimore & Ohio," which appeared in the October issue, it was stated that the last of these structures, built at Philadelphia, Pa., included approximately 70,000 cu. ft. of preframed timber. This should have been 70,000 ft. b.m.

Voters of New York State Approve Crossing Amendment

An amendment to the state constitution of New York, providing that the state pay the entire cost of crossing elimination projects and recover from the railroads only the amount of net benefit to them up to a maximum of 15 per cent of the total cost of such projects, was passed by the voters of that state in the last election. The new amendment replaces previous legislation requiring that the railroads be assessed 50 per cent of the cost of grade separation structures.

Suggests Railroads Go Into National Trucking Business

A report submitted by the Railroad Securities committee to the convention of the Investment Bankers of America at White Sulphur Springs, W. Va., on October 28, recommended that railroads should be permitted to own and operate trucks under fewer restrictions as to routes and character of service, and suggests that the railroads should establish a nation-wide trucking subsidiary for all carriers through an agency such as the Railway Express Agency or the Railway Express Motor Transport.

Streamliners Show Substantial Earnings

In a report covering the operations of some 76 high-speed "luxury" trains, which the American railroads have introduced in the last four years, Coverdale & Colpitts, consulting engineers, New York, conclude that "Every lightweight streamlined train operating in this country has produced additional passenger traffic and substantial earnings for the railroad placing it in service." According to the report, the highest ratio of earnings for the year ending June 30, 1938, was made by the Denver "Zephyrs" of the Chicago, Burlington & Quincy, which earned a net of $1,568,831, amounting to 75.1 per cent of the gross earnings, and the highest net revenues per train-mile were earned by the two "Daylights" of the Southern Pacific and the two "Hiawathas" of the Chicago, Milwaukee, St. Paul & Pacific, which earned respectively, $3.211 and $3.217 per train mile.

1937 Railway Accidents Lower

According to Accident Bulletin No. 106 issued by the Interstate Commerce Commission's Bureau of Statistics, railway accidents of all kinds in 1937 resulted in death to 5,350 persons and injuries to 36,692, which was 48 fatalities less than the number in the preceding year, and, computed on a train mile basis, was a more favorable figure than for any year since 1932. The passenger fatality rate per million passenger miles for 1937 was a new low for the 18 year period from 1922 to 1937, inclusive. A chart indicating the relative importance of various classes of persons in the total number of fatalities for 1937 shows that trespassers constituted 49 per cent; persons at grade crossings, 35 per cent; and employees 10 per cent. Of the total number of persons injured in that year, employees constituted 45 per cent; persons at grade crossings 24 per cent; trespassers 12 per cent; and passengers on trains 12.5 per cent.

Suggests Government Subsidize Railroads

Stating that railroad facilities are at the present time inadequate to meet emergency demands for national defense, Harry A. Wheeler, president of the Railway Business Association, suggests a national subsidy to the railroads for a test period of five years to cover one-fourth of the cost during that period of the maintenance of roadway and structure, and the establishment of a revolving fund of $500,000,000 to cover 100 per cent of the cost of new cars and locomotives, on which the government would hold the equipment trust notes.

C. M. Burpee Becomes Managing Editor of Maintenance Cyclopedia

C. Miles Burpee has resigned as research engineer in the purchasing department of the Delaware & Hudson, with headquarters at Albany, N.Y., to become managing editor of the *Railway Engineering and Maintenance Cyclopedia*, a Simmons-Boardman publication, succeeding Arthur H. Peterson, who has resigned because of ill health. Mr. Burpee was born at Edmunston, N.B., on August 18, 1900, and graduated from the University of New Brunswick in 1923. His first railway experience was gained during the summers of 1918 to 1920, when he was employed in the maintenance of way department of the Canadian National. During the summers of 1921 to 1923 he was employed by the department of public works of the Province of New Brunswick as resident engineer on highway construction. In the following year he was associated with Marquette University, Milwaukee, Wis., as instructor of surveying, descriptive geometry and drawing. On July 1, 1924, he entered the employ of the Delaware & Hudson as bridge and building supervisor on the Pennsylvania division, and later served in the same capacity and as track supervisor on the Susquehanna division. In 1928, he was appointed bridge and building master of the Saratoga division, and in April, 1930, he was promoted to purchasing engineer. In May, 1933, he was advanced to research engineer in the purchasing department, with headquarters at Albany, his duties consisting of the application of research in connection with the purchase and use of materials as well as the purchase and supervision of inspection of all forest products. He has been active in the Purchases and Stores division of the Association of American Railroads and the American Railway Bridge and Building Association of which latter organization he was president during the past year.

C. Miles Burpee

Association News

Roadmasters Association

Vice-President F. B. Lafleur has called a meeting of the Executive committee at Chicago on December 3, to organize the work of the association for the new year and especially to appoint the committees that will undertake the preparation of reports for presentation at the next convention.

Bridge and Building Association

President Armstrong Chinn has called a meeting of the Executive committee at Chicago on December 6, to select the personnel of committees for the next convention and to transact other business incident to the work of the association for the new year.

Maintenance of Way Club of Chicago

Eighty-six members and guests attended the November 28 dinner meeting of the club, which was addressed by C. H. R. Howe, cost engineer of the Chesapeake & Ohio, on The Relation Between Material and Labor Costs in the Maintenance of Way Department. The next meeting of the club will be on December 19, when a member of the Drainage Engineering Company will present an illustrated discussion of, Stabilizing the Roadbed Through Subdrainage.

American Railway Engineering Association

Bulletin No. 406, for November, was mailed to all members during the month, this bulletin including the reports of the committees on Standardization, Electricity, Clearances, Uniform General Contract Forms, and Economics of Railway Location and Operation, all of which will be presented before the annual convention of the association in March, 1939. This bulletin follows a procedure started last year, in that it groups together all of the reports which will be presented on one day of the convention. Bulletin No. 407, which will be mailed to members during the month, will contain reports of the committees on Buildings, Water Service, Fire Protection and Sanitation, Waterways and Harbors, Signals and Interlocking, Maintenance of Way Work Equipment, Economics of Railway Labor, and, possibly, Highways.

The Association of American Railroads and the rail manufacturers have approved a two-year extension of their joint contract with the University of Illinois for the continuation of the transverse fissure investigation, at an expenditure of $45,000 a year. The A.A.R. has also, on the recommendation of the A.R.E.A., appropriated an additional $6,000 for the continuation of the investigation of the causes of the cracking of boiler steel, which investigation is being carried out under the sponsorship of a joint committee representing the railways, boiler manufacturers, public service companies, and others.

Five committees held meetings during November, as follows: Ties, at St. Louis, Mo., on November 4; Roadway and Ballast, at Chicago, on November 13; Records and Accounts, at Roanoke, Va., on November 15-16; Track, at Chicago, on November 16; and Waterproofing of Railway Structures, at Chicago, on November 17-18.

Among the meetings scheduled for December is a joint meeting of the Board of Direction and the Nominating committee in New York on December 9, the Nominating committee meeting in the morning and the board, as a whole, in the afternoon. Other meetings scheduled include one of the Committee on Water Service, Fire Protection and Sanitation, at New York, on December 7, and one of the Committee on Rail, at New York, on December 8.

Wood Preservers Association

Plans are rapidly approaching completion for the program for the thirty-fifth annual convention, which will be held at the Hotel Willard, Washington, D.C., on January 24-26. The program includes a session on Tuesday evening, January 24, devoted to the use of treated timber in government construction, at which a number of federal officers engaged in construction activities will present their experiences in the use of treated timber. Wednesday forenoon will be devoted to a Users Day session, at which officers of railways and other wood using industries will describe the economies effected on their properties through the use of treated timber. Plans are being made for those members of the association traveling through Chicago, St. Louis and Cincinnati to travel together in a special train, scheduled to stop at a couple treating plants enroute.

Metropolitan Track Supervisors Club

The next meeting will be held at the Hotel McAlpin, New York, on the afternoon of December 8, following a luncheon at 12 o'clock. In scheduling the meeting for this date, the club is following its usual practice of holding its December meeting on the same date as the annual dinner of the New York Railroad Club which will be held in the evening.

At this meeting the club will be addressed by three speakers who will describe the experiences of different railroads in New England during the recent flood and hurricane disaster. They will include A. A. Cross, division engineer, New York, New Haven & Hartford, Hartford, Conn.; H. F. Fifield, engineer maintenance of way, Boston & Maine, Boston, Mass.; and R. D. Garner, chief engineer, Central Vermont, St. Albans, Vt. At least one of the talks will be accompanied by the presentation of slides. Another subject that will be given consideration at the meeting is the proposal for broadening the name and scope of the club that was advanced for consideration at the October meeting.

Personal Mention

General

H. R. Younger, division engineer of the Kootenay division, British Columbia district, of the Canadian Pacific, with headquarters at Nelson, B. C., has been promoted to superintendent of the Kettle Valley division, with headquarters at Penticton, B. C.

H. H. Harsh, division engineer on the Baltimore & Ohio, with headquarters at Akron, Ohio, has been promoted to superintendent of the Newark division, with headquarters at Newark, Ohio. Mr. Harsh was born on May 22, 1885. He entered railway service on June 1, 1906, as an assistant in the engineering corps of the maintenance of way department of the B. & O. at Chicago, and served in that capacity on the old Ohio River division and the Wheeling division until promoted to assistant division engineer at Wheeling on August 1, 1910. He was appointed division engineer at Wheeling on January 1, 1912, and in the following 17 years was

H. H. Harsh

transferred consecutively to Cleveland, Ohio, Pittsburgh, Pa., and Akron, Ohio, becoming division engineer at Akron on August 1, 1929. He became assistant superintendent of the combined Akron-Chicago division at Garrett, Ind., on February 15, 1936, returning to Akron as division engineer on March 30, 1938.

W. E. Rivers, division engineer and acting assistant superintendent on the Canadian National, with headquarters at Prince Albert, Sask., has been promoted to assistant superintendent with jurisdiction over the Tisdale, Chelan, Brooksby, St. Brieux, Meskanaw, Arborfield and Cudworth subdivisions.

Mr. Rivers was born at Staffa, Ont., on April 5, 1888, and entered railway service in the summer of 1909 between terms of school as a rodman in the engineering department of the New York Central at Buffalo, N.Y. In October, 1912, he entered the service of the Canadian National as a rodman in the engineering department, and subsequently served as

a draftsman, instrumentman, resident engineer, and office engineer. During the war he was a lieutenant in the Canadian Engineers C.E.F., and in August, 1920, after his return to Canadian National service, he was promoted to divisional engineer, with headquarters at Kamloops, B.C., and later to division engineer at Edson, Alta., and Prince Albert.

Evert C. Blundell, assistant to the executive vice-president, in charge of track maintenance, of the Chicago, St. Paul, Minneapolis & Omaha, with headquarters at St. Paul, Minn., retired on November 1. Mr. Blundell was born in Le Sueuer County, Minn., on June 19, 1867, and entered railway service with the Chicago & North Western at Highmore, S.D., in 1880. He subsequently served the Sioux City & Northern (now part of the Great Northern) and the Pacific Shore Line (now part of the Chicago, Burlington & Quincy) from 1889 to 1896, and the Union Pacific from 1896 to 1898. In 1898, he went with the Omaha, and later was promoted to roadmaster, serving in that capacity successively at Itasca, Wis., and Eau Claire. In 1912, he was advanced to assistant superintendent, with headquarters at Eau Claire, and in January, 1913, he was promoted to division superintendent, with headquarters at Omaha, Neb. Mr. Blundell was further advanced in May, 1933, to assistant to the vice-president and general manager, with supervision over all track maintenance matters, and with headquarters at St. Paul. His title was later changed to assistant to the executive vice-president.

Sidney H. Osborne, assistant to the vice-president of operations of the Union Pacific, with supervision over safety matters, and with headquarters at Omaha, Neb., retired on November 1. Mr. Osborne entered railway service in April, 1900, with the Oregon Short Line (part of the Union Pacific system), and was advanced through various positions in the engineering department to that of assistant engineer in charge of branch line construction in 1909. In 1913, he was promoted to division engineer of the Idaho division. In December, 1914, he left railway work, but re-entered the service of the Union Pacific in February, 1917, as an assistant engineer in the office of the engineer maintenance of way at Omaha. In December of the same year he was appointed division engineer of the Kansas division, and later served successively in that capacity on the Nebraska, Los Angeles, and Colorado divisions. On February 15, 1927, Mr. Osborne was appointed engineer maintenance of way at Omaha, and when this office was discontinued in 1931, returned to the Colorado division as division engineer. In April, 1935, he was promoted to assistant to the executive vice-president of the system, in charge of safety, with headquarters at Omaha.

Charles E. Johnston, president of the Kansas City Southern, with headquarters at Kansas City, Mo., and an engineering officer by training, has been elected chairman of the Western Association of Railway Executives, Chicago, effective January 1. He succeeds **Harry G. Taylor,** who died on August 10, 1938. This position was created in 1932 as part of a movement to control revenue losses due to competition between Western lines, and bring about savings for the Western lines through the elimination of preventable waste. Mr. Johnston was born at St. Elmo, Ill., on October 30, 1881, and entered railway service in 1897 as an office boy and call boy for the Chicago, Paducah & Memphis (now a part of the Chicago & Eastern Illinois). For one year

Charles E. Johnston

he served as chainman, rodman and transitman on the St. Louis-Southwestern, and in 1898, returned to the C. & E. I., where he was employed in the engineering department until 1900. In that year, he was appointed an assistant engineer on the St. Louis-San Francisco, and in 1903, was appointed resident engineer on location and construction for the Missouri Pacific. In the same year he was appointed assistant engineer maintenance of way for the St. Louis-San Francisco, resigning in 1906 to become locating engineer for the Kansas City Southern. He held this position until 1908, when he was promoted to office engineer, and a year later to division engineer. In 1911, he was promoted to chief engineer, and in 1917, to general manager. In 1924, he was elected vice-president and general manager, and in 1928, was elected president.

Engineering

A. B. Truman, division engineer on the Atchison, Topeka & Santa Fe, with headquarters at Las Vegas, N.M., has been transferred to Dodge City, Kan., succeeding **R. G. Whyman,** who in turn, has been transferred to Las Vegas.

F. P. Funda, division engineer on the Chicago, Rock Island & Pacific, with headquarters at Little Rock, Ark., has been transferred to Kansas City, Mo., replacing **Harry M. Long,** who has been transferred to Little Rock, succeeding Mr. Funda.

G. Murray, assistant division engineer and roadmaster on the Canadian National, with headquarters at Melville, Sask., has been promoted to acting division engineer of the Prince Albert division, with headquarters at Prince Albert, Sask., succeeding **W. E. Rivers,** whose promotion to assistant superintendent is announced elsewhere in these columns.

F. Helm, district engineer, Western district, Eastern lines, of the Atchison, Topeka & Santa Fe, with headquarters at Topeka, Kan., has been appointed district engineer, Eastern district, Eastern lines, with the same headquarters, succeeding **J. L. Starkie,** who in turn, has been appointed district engineer, Western district, Eastern lines, with headquarters as before, at Topeka.

J. W. Purdy, division engineer of the Baltimore & Ohio, with headquarters at Wheeling, W. Va., has been transferred to Akron, Ohio, to succeed **H. H. Harsh,** whose appointment as superintendent of the Newark (Ohio) division is noted elsewhere in these columns. **Guy Long,** assistant division engineer at Wheeling, has been promoted to division engineer there, succeeding Mr. Purdy.

Effective November 1, the office of division engineer on the Atchison, Topeka & Santa Fe at Marceline, Mo., was discontinued, and **D. M. Rankin,** division engineer at that point was transferred to the Oklahoma division, with headquarters at Arkansas City, Kan., succeeding **K. W. Claybaugh,** who has been assigned to other duties. The jurisdiction of **T. H. McKibben,** division engineer of the Illinois division, with headquarters at Chillicothe, Ill., was extended to include the Chicago Terminal division and the Missouri division, and the jurisdiction of **H. M. Swope,** division engineer of the Eastern division, with headquarters at Emporia, Kan., was extended to include the Kansas City division.

Raymond H. Mitchell, track supervisor on the Boston & Maine, at Salem, Mass., has been promoted to assistant division engineer of the Portland division, with headquarters at Dover, N.H., succeeding to a position that was vacated by **Clifford H. Higgins** some time ago when he was promoted to division engineer of the New Hampshire division. Mr. Mitchell was born on June 1, 1899, at Woodsville, N.H., and received his higher education at Norwich university. He entered railway service with the Boston & Maine on June 16, 1917, as a chainman, later serving as a draftsman and transitman. On March 6, 1929, he was promoted to assistant track supervisor, with headquarters at Portsmouth, N.H., being transferred to Rochester, N.H., on November 1, 1929. On March 20, 1930, Mr. Mitchell was further advanced to track supervisor, with the same headquarters, being transferred to Portsmouth on December 1, 1931, and to Salem on February 1, 1934. He was holding the latter position at the time of his recent appointment as assistant division engineer, on November 1.

Ralph R. Strothers, assistant chief engineer of the Chicago, St. Paul, Minneapolis & Omaha, with headquarters at St. Paul, Minn., has been appointed assistant chief engineer and superintendent of ways and structures, a newly created position, with the same headquarters, and **Harold**

W. Jensen, assistant engineer on the Galena division of the Chicago & North Western, with headquarters at Chicago, has been appointed assistant engineer in charge of track maintenance of the Omaha, with headquarters at St. Paul.

Mr. Strothers was born at Hubbard, Iowa, on August 17, 1885, and graduated in civil engineering from Iowa State College in 1909. He entered railway service in the engineering department of the North Western in September, 1909, and five years later was promoted to assistant engineer on field work for the Omaha. In 1920, he was advanced to assistant engineer in charge of estimates, with headquarters at St. Paul, and on February 1, 1929, he was promoted to assistant chief engineer.

Ralph R. Strothers

Mr. Jensen was born at McHenry, Ill., on May 18, 1899, and graduated in civil engineering from the University of Wisconsin in 1925. He entered railway service in September, 1925, as a rodman on the Galena division of the North Western, and the following year was appointed inspector on construction work. On April 1, 1928, he was promoted to instrumentman and in January, 1929, he was advanced to assistant general bridge inspector. He left the service for nearly a year in 1930, but returned in December of that year as assistant construction accountant in the general office of the North Western at Chicago. Mr. Jensen was promoted to assistant roadmaster, with headquarters at West Chicago, Ill., in January, 1936, and the following July was advanced to assistant engineer on the Galena division, with headquarters at Chicago.

Pericles G. Savidis, assistant engineer on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago, has been promoted to office engineer in the chief engineer's office at that point, succeeding **Edward L. Bahls,** whose death on October 27 is reported elsewhere in this issue. **Asa B. Chapman,** chief draftsman in the chief engineer's office at Chicago, has also been advanced to office engineer in that office, replacing **Hans J. Hansen,** whose death on November 4, is announced elsewhere in these columns.

Mr. Savidis was born in Asia Minor, and received his engineering education at Anatolia College, Asia Minor, and at Ohio State University. He entered railway service in 1905 as a rodman on the Pennsylvania, and in 1911 he went with the Chicago, Rock Island & Pacific, as an estimator, later being promoted to maintenance and accounting clerk and draftsman. Mr. Savidis entered the service of the Milwaukee as a draftsman in Chicago in 1917, and in 1923 he was promoted to assistant engineer.

Mr. Chapman was born at Elmwood, Neb., and graduated in engineering from the University of Washington, Seattle, Wash. After graduation he served as a draftsman for the U.S. Engineers at Seattle, and later in various capacities in the Bureau of Valuation of the Interstate Commerce Commisison. In May, 1919, he entered the service of the Milwaukee as a draftsman, at Seattle, and was later promoted to assistant engineer. Mr. Chapman was transferred to Chicago in April, 1933, and in August, 1938, he was promoted to chief draftsman.

John W. Wheeler, engineer of highway negotiations of the Chicago, Burlington & Quincy, with headquarters at Chicago, has been promoted to assistant chief engineer of the Burlington Lines, with the same headquarters. Mr. Wheeler was born at Crown Point, Ind., on May 31, 1893, and graduated in civil engineering from Purdue University in 1916. On May 20, 1916, he entered highway service as project engineer for the highway department of Vermillion County, Danville, Ill. After several years in highway engineering and contracting work, he was appointed State Highway Commissioner of Indiana on February 14, 1933. On January 15, 1937, he was made engineer of highway negotiations of the C. B. & Q., with headquarters at Chicago. Mr. Wheeler was also chairman of the Indiana State Planning Board from 1934 to 1938, and has been a director of the Chicago Regional Planning Association since 1934, and a member of the Board of Trustees of Purdue University since 1934.

John W. Wheeler

Track

Leon Q. Hill, track supervisor on the Chicago, Rock Island & Pacific, with headquarters at Colorado Springs, Colo., has been transferred to Winnfield, La.

L. L. Harding, Jr., track supervisor on the Pennsylvania, with headquarters at Shire Oaks, Pa., has been transferred to Toledo, Ohio, replacing **C. B. Brown,** who has been assigned to other duties.

H. F. Reilly, supervisor of track on the Lehigh Valley, with headquarters at Wilkes-Barre, Pa., has been transferred to Easton, Pa., succeeding **J. A. Maughan,** who has been transferred to Pittston Junction, Pa.

A. O. Martin, acting roadmaster on the Chicago, Rock Island & Pacific, with headquarters at Ottawa, Ill., has been promoted to roadmaster, with headquarters at Peoria, Ill., succeeding **N. W. Baxter,** who has been assigned to other duties.

G. R. MacKay, section foreman on the Canadian National at Biggar, Sask., has been promoted to roadmaster with jurisdiction over the Yorkton, Rhein, and Tonkin subdivisions and with headquarters at Melville, Sask., succeeding **G. Brown,** whose jurisdiction has been transferred to the Touchwood subdivision, including the Melville Yard, with headquarters at Melville. Mr. Brown replaces **G. Murray,** whose promotion to acting division engineer is announced elsewhere in these columns.

K. W. Eustace, track supervisor on the McCook division of the Chicago, Burlington & Quincy, has been promoted to roadmaster with headquarters at Orleans, Neb., succeeding **Stephen J. Owens, Jr.,** who has been transferred to Ferry, Neb., relieving **Leslie Cross,** who has been transferred to Sheridan, Wyo., replacing **Daniel E. Lynch,** deceased. Mr. Eustace was born at Bellaire, Kan., on January 9, 1898, and entered railway service on October 19, 1921, as a section foreman on the Wymore division of the Burlington. On March 16, 1936, he was promoted to track supervisor on the Wymore division.

H. Whyte, an extra gang foreman on the Canadian National, has been appointed roadmaster on the Hornepayne division, with headquarters at Hornepayne, Ont., to succeed **J. F. Sinclair,** who has been transferred to the Stratford division. **H. Jacklin,** roadmaster on the Sudbury subdivision of the Capreol division, with headquarters at Capreol, Ont., has been transferred, with the same headquarters, to the Ruel subdivision, succeeding **W. H. Johnson,** who in turn replaces Mr. Jacklin on the Sudbury subdivision.

Mr. Whyte was born at St. George, Ont., on September 14, 1893, and attended Brantford Collegiate Institute, Brantford, Ont. He entered railway service with the Grand Trunk (now part of the Canadian National) on November 25, 1918, as a section laborer. Two years later, he was advanced to section foreman and subsequently he held the positions of extra gang forman, general foreman and assistant roadmaster.

A. F. Ewart, transitman on the Atchison, Topeka & Santa Fe, at Chicago, has been promoted to roadmaster with headquarters at Ottawa, Kan., succeeding

Trains "hit 80"

While This Pipe Was Going In

What a spot to install a new drainage outlet! Under four main line tracks . . . 156 trains daily . . . speeds up to 80 miles an hour! Yet this 48-inch Asbestos Bonded Armco Pipe was jacked through the fill — a total distance of 62 feet *without a single "slow order."*

Developed years ago by Armco engineers, this method of jacking pipe through embankments has solved many a tough drainage problem for many a railroad. Traffic delays have been eliminated, costs reduced from 30 to 50 per cent. Besides there is no danger to workmen because the entire jacking operation is completed *below track level.* This also prevents settling of the roadbed during installation and afterward.

If you are considering new drainage openings or replacements under your tracks, Armco engineers can offer you able assistance. Just call or write our nearest office. Ingot Iron Railway Products Co., Middletown, O. (Member of Armco Culvert Manufacturers Association); Berkeley, California; Dallas, Atlanta, Philadelphia, Salt Lake City, Minneapolis, Los Angeles, Portland, Cleveland, Spokane, St. Louis, Chicago, Richmond, Houston, Denver.

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A PRODUCT ORIGINATED AND DEVELOPED BY ARMCO ENGINEERS

Harold G. Wood, who has been transferred to Chillicothe, Ill., replacing **John O'Brien.**

Mr. Ewart was born at Newton, Kan., on April 11, 1902, and attended Bethel College at Newton, and Kansas University. He entered railway service on the Santa Fe in April, 1925, later returning to school. After several years service in the engineering department of the Socony Vacuum Oil Company, he returned to the Santa Fe in the engineering department at Newton in March, 1935. In October, 1938, he was transferred to Chicago as transitman on terminal construction work, the position he held at the time of his recent promotion.

Bernard J. Casey, assistant track supervisor on the Portland division of the Boston & Maine, with headquarters at Rochester, N.H., has been promoted to track supervisor on the Terminal division, with headquarters at Salem, Mass., succeeding **Raymond H. Mitchell,** whose appointment as assistant division engineer is noted elsewhere in these columns. **John F. Bourne,** general foreman on the Terminal division, has been promoted to assistant track supervisor on the Portland division at Rochester to succeed Mr. Casey.

Mr. Casey was born at Rochester on March 2, 1898, and entered the service of the Boston & Maine on April 22, 1918, as a trackman. On July 16, 1922, he was promoted to yard foreman at Salem, and on June 7, 1928, he was appointed general foreman at Boston. On April 16, 1930, Mr. Casey was promoted to assistant track supervisor at the same point and on February 1, 1935, he was transferred to Lawrence, Mass., where he remained for two years. For a time in 1935 and again in 1937, Mr. Casey served as acting track supervisor in charge of rock ballasting operations, each time returning to the position of assistant track supervisor. In 1937, he was transferred as assistant track supervisor to Rochester, remaining at this point until his recent promotion to track supervisor, which was effective on November 1.

George H. Morley, extra gang foreman on the International Great Northern (part of the Missouri Pacific system), has been promoted to roadmaster of the Navasota district, with headquarters at Navasota, Tex., succeeding **A. C. Soechting,** who has been transferred to San Antonio, Tex., relieving **Thomas H. Love,** who retired on October 31.

Mr. Morley was born at Marshall, Ark., on July 30, 1889, and entered railway service as a laborer on the Missouri & North Arkansas in July, 1914. He was promoted to foreman in September, 1917, but left to serve with the U. S. Army during the war. He returned to the Missouri & North Arkansas in March, 1919, as a section foreman, but left that road to go with the Missouri Pacific as section foreman at Kensett, Ark., in February, 1921. In February, 1927, he was advanced to extra gang foreman on the International Great Northern.

Mr. Love was born in Louisiana on October 9, 1870, and entered railway service in March, 1887, as a water boy for an extra gang on the Southern Pacific at Houston, Tex. In March, 1888, he became a laborer on the International Great Northern, and in 1889, he was promoted to straw boss on an extra gang. In 1890, he was advanced to extra gang foreman, and in 1904, to roadmaster, with headquarters at Navasota. In 1905, he was transferred to San Antonio, and in 1907, he was promoted to general roadmaster. In 1916, he was advanced to assistant superintendent, and in 1922, he was again appointed roadmaster with headquarters, as before, at San Antonio.

Wilbur L. Seabridge, transitman on the San Francisco Terminal division of the Atchison, Topeka & Santa Fe, Coast lines, at San Francisco, Cal., has been promoted to roadmaster, with headquarters at Kingman, Ariz., succeeding **Leon E. Smith,** who has been transferred to Los Angeles, Cal., replacing **Arthur L. Pollock,** who retired on November 1.

Mr. Seabridge was born at Winfield, Kan., on July 4, 1897, and entered railway service on July 16, 1916, as a timekeeper for an extra gang on the Santa Fe. On October 11, 1916, he was appointed a chainman in the engineering department. He enlisted in the U. S. Navy in May, 1918, but returned to the Santa Fe in September, 1919, as a rodman in the engineering department. On January 28, 1923, he was promoted to transitman.

Mr. Pollock was born in Chicago, Ill., on August 17, 1873, and entered railway service as a section laborer on the Missouri, Kansas & Texas in 1898. He served as a section man on the Kansas City & Southwestern (now part of the Missouri Pacific) in 1900, and as a track man on the St. Louis Iron Mountain & Southern (now a part of the Missouri Pacific) in 1901. He was promoted to roadmaster on the International & Great Northern (part of the Missouri Pacific) in 1903, and went with the Louisiana & Arkansas as a roadmaster in 1906. His service with the Santa Fe started as track foreman at China Basin in San Francisco in July, 1907. The same year he was promoted to general foreman on the Valley division. In 1913, he was transferred to the Albuquerque division at Dalies, N. M., and served at that point until October, 1922, when he was made construction roadmaster in charge of second track construction between Yampai, Ariz., and Topock. He was superintendent of track and roadway on the Coast lines of the Santa Fe from October, 1923, until March 1924. Mr. Pollock was transferred to his present position as roadmaster at Los Angeles in charge of the entire terminal, in August, 1925, which position he has held until the time of his retirement.

Bridge and Building

Albert C. Tinsley, assistant supervisor of bridges and buildings of the Pocahontas division of the Norfolk & Western, with headquarters at Bluefield, W. Va., whose appointment as supervisor of bridges and buildings of the Norfolk division, with headquarters at Crewe, Va., was reported in the November issue, was born on October 28, 1900, at Holcomb Rock, Va. Mr. Tinsley received his higher education at the Virginia Polytechnic Institute, graduating in 1924. He entered railway service with the Norfolk & Western in the same year and served as a rodman, inspector, levelman and transitman in the engineering department until 1932. For two years thereafter, he was engaged in electric welding work, then returning to the engineering department for another two years. In 1936, Mr. Tinsley was promoted to assistant supervisor of bridges and buildings, which position he held until his recent promotion, which was effective on October 1.

Obituary

R. L. Latham, chief engineer of the Toronto, Hamilton & Buffalo, with headquarters at Hamilton, Ont., died on November 12.

C. E. Weaver, general manager, and at one time assistant chief engineer, of the Central of Georgia, with headquarters at Savannah, Ga., died at that point on November 28.

Frank A. Greene, who retired as roadmaster on the Southern Pacific, with headquarters at Merced, Cal., in 1924, died on October 7.

Thomas McDonough, retired supervisor of bridges and buildings on the Chesapeake & Ohio at Columbus, Ohio, died at Cumberland, Md., on September 23.

Hans Jorgen Hansen, office engineer in the office of the chief engineer of the Chicago, Milwaukee, St. Paul & Pacific, at Chicago, died suddenly of a heart attack at Chicago on November 4. Mr. Hansen was born at Aarslev, Fyn Island, Denmark, on February 14, 1871, and attended Armour Institute of Technology. After leaving school, he secured employment with a number of firms connected with the construction of prominent bridges, among them: The Hall Bascule Bridge Company; J. B. Strauss; Vierling, McDowell & Co.; and William Hughes, consulting engineer. He entered the service of the Milwaukee on May 1, 1906, as a draftsman, and in 1915, he was promoted to squad foreman. Mr. Hansen was advanced to office engineer in 1917.

Laurits Walter Skov, hydraulic engineer of the Chicago, Burlington & Quincy, with headquarters at Chicago, died at his home in Chicago on November 16, after an extended illness. Mr. Skov was born at Alden, Minn., on March 9, 1885, and attended Grand View College, Des Moines, Iowa, and Armour Institute of Technology. He entered railway service in the bridge department of the Burlington in November, 1906, and was promoted successively in that department to tracer, detailer, designer and on June 1, 1918, to chief designer. On February 10, 1919, he was appointed terminal viaduct engineer, and two months later was advanced to office engineer in the chief engineer's office at Chicago. On August 20, 1929, Mr. Skov was appointed special engineer

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Haynes Stellite Burnishing Rollers are used in a large number of railroad shops for burnishing locomotive and car axle journals. They are also used in many other industries where parts require extremely high finish and maximum resistance to wear.

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of design on the 16th Street grade separation work involving the Canal Street bridge at Chicago, and on September 1, 1931, he returned to his former position of office engineer. Five years later he was advanced to hydraulic engineer.

Edward L. Bahls, office engineer in the chief engineer's office of the Chicago, Milwaukee, St. Paul & Pacific at Chicago, died suddenly October 27 of a heart attack. Mr. Bahls was born on March 14, 1888, and entered railway service as a rodman on the construction of the Puget Sound Lines of the Milwaukee in 1907. He was later advanced to instrumentman and draftsman. In 1910, he went with the Chicago, Rock Island & Pacific as a draftsman on the location and construction of the Short Line between Carlisle, Iowa, and Allerton, and in 1913, he went with Rand McNally and Co., in Chicago, as draftsman. He returned to the Milwaukee in 1917, as a draftsman at Chicago, and in 1918, he was promoted to assistant engineer. Mr. Bahls was further advanced to office engineer in 1928.

William L. Darling, retired chief engineer of the Northern Pacific and at one time chief engineer of the Chicago, Rock Island & Pacific, and of the St. Louis, Kansas City & Colorado, died in St. Paul on October 27. Mr. Darling was born at Oxford, Mass., on March 26, 1856, and graduated from Worcester Polytechnic Institute. He entered railway service in the engineering department of the Northern Pacific and in June, 1879, was promoted to resident engineer, later being appointed locating engineer. From August, 1883, to February, 1884, he was resident engineer on the St. Paul & Northern Pacific (now part of the Northern Pacific). In April, 1884, he went with the Chicago, Burlington & Quincy as locating engineer, and in December, 1884, with the Florida Railway in the same capacity. In August, 1885, he was appointed engineer in charge of terminals on the Chicago, Burlington & Northern (now part of the Burlington). In May, 1887, he was appointed chief engineer of the Duluth, Watertown & Pacific (now part of the Great Northern), and in December of that year he was appointed assistant engineer of the St. Paul, Minneapolis & Manitoba (now part of the Great Northern). In January, 1889, he was appointed assistant engineer on the Northern Pacific, and in March, 1891, he was promoted to principal assistant engineer. In July, 1898, he was advanced to assistant chief engineer, and in June, 1901, he was promoted to chief engineer. In August, 1903, he resigned to become chief engineer of the Chicago, Rock Island & Pacific, and also of the St. Louis, Kansas City & Colorado (now part of the Rock Island). Mr. Darling returned to the Northern Pacific in January, 1906, as chief engineer, and in addition during the years from 1906 to 1909, was consulting engineer in active charge of construction of the Spokane, Portland & Seattle from Spokane, Wash., to Portland, Ore. He retired as chief engineer on October 1, 1916, to enter private practice as a consulting engineer at St. Paul, Minn.

Supply Trade News

General

James A. Bradley & Company, Chicago, have been appointed distributors for **Youngstown Sheet & Tube Company's** tubular products.

Personal

Wilder A. Chapman, formerly secretary of Skinner and Sherman, Inc., Boston, Mass., has been appointed manager of laboratories for **Robert W. Hunt Company,** Chicago.

W. I. Howland, Jr., vice-president in charge of western sales of the **Carnegie-Illinois Steel Corporation,** Chicago, has been transferred to Milwaukee, Wis., as manager of sales.

Arthur Roeder, president of the **Colorado Fuel & Iron Corporation,** has been elected chairman of the board, and has been succeeded by **W. A. Maxwell, Jr.,** vice-president in charge of operations.

Arthur Roeder

Mr. Roeder was born in 1884 at Pleasantville, N.J., and graduated from Cornell University, college of civil engineering, in 1907. In 1910, he was employed as a junior engineer by the City of Newark, and later served as salesman, sales manager, production manager, and assistant general manager for Robert H. Ingersoll & Brother. Later he entered the employ of the United States Radium Corporation as treasurer, and later became president. In 1926 he was elected executive vice-president of the American Linseed Company, and in 1929, he was elected president of the Colorado Fuel & Iron Corporation. He also served as receiver and trustee from 1933 to 1936 during reorganization proceedings.

Mr. Maxwell was born in 1879 at Ardmore, Pa., and attended Pennsylvania State College. From 1900 to 1902 he was employed in the Philadelphia Post Office, and from the latter year to 1919 worked for the Carnegie Steel Company at Homestead, Pa., Sharon, Youngstown, Ohio, and Homestead, as laborer, foreman, assistant superintendent, and superintendent, open hearth department. In the latter year he was appointed assistant general superintendent of the Midvale Steel & Ordnance Company at Johnstown, Pa., which position he held until 1920, when he entered the employ of the Inland Steel Company at Indiana Harbor, Ind., as gen-

W. A. Maxwell, Jr.

eral superintendent. He resigned from the latter position in 1927 to become production manager of the Colorado Fuel & Iron Corporation, which position he held until 1929, when he was elected vice-president in charge of operations.

Obituary

G. La Rue Masters, vice-president of the National Lock Washer Company, Newark, N.J., died on October 25, at his home in South Orange, at the age of 58 years. Mr. Masters started his early career in the paper business. He later served as manager and then as president of Unger Brothers, silversmiths. During the World War, he worked with the aircraft industry and after the war, became associated with the National Lock Washer Company in the car equipment department

G. La Rue Masters

and later became vice-president in charge of all sales of the company. Some years ago, he was elected a director of the company and was serving as a director and vice-president at the time of his death.

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THE Heat-Treated Bolts and Hot-Forged Nuts that Bethlehem makes permit really tightening up rail joints and hold them to the rigidity required by today's fast traffic. Trackmen can pull on their wrenches—there's no danger of stripping threads. And the joints will stay tight—will hold the smoothness required for streamliners despite the hammering of heavy traffic.

Rail ends get proper protection with these tight joints. Rail wear is reduced; there is less roadbed pounding and less wear and tear on rolling stock.

The threads on these bolts and nuts are clean cut and full, and they always fit, any nut on any bolt.

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"In the Waste Basket"

"Bill, why is it that we're getting so little business from the ..... railroad? Are you neglecting that road?" asked the sales manager.

"Indeed, I am not. I called on the chief engineer only last week," replied his district sales representative.

"Why don't we get his business then?"

"I'll tell you why—and, furthermore, it's what he told me."

"Well, what'd he say?"

"He asked me why you didn't back me up."

"What did he mean by that?"

"That's what I asked him."

"What was his answer?"

"He said he never heard of our company except when I called, while he saw our competitors' products in Railway Engineering and Maintenance every month."

"But he's on our mailing list for our circulars."

"That may be true but those circulars don't get to men like him."

"How do you know that?"

"Boss, these men are on the mailing lists of so many companies that if they read all of the literature that's sent them, they wouldn't have any time to do their work."

"You mean they don't see our literature?"

"That's exactly what I mean. It goes to their chief clerks."

"And what do they do with it?"

"They file a little of it but most of it goes into the waste basket. His chief clerk told me it's a shame the amount of money that companies like ours waste that way. He fills a waste basket nearly every day."

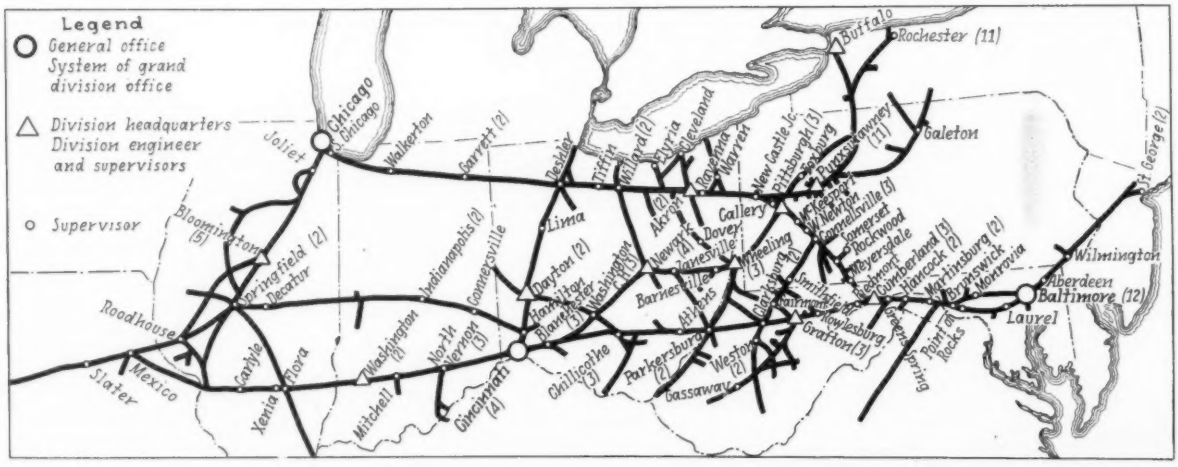
"I suppose you contend that advertising doesn't pay and think that we should give this money to you to spend on entertainment."

"Nothing of the kind, Boss. But why can't we put it into *real* advertising in Railway Engineering and Maintenance? They don't throw *that magazine* away. The chief engineer reads it from cover to cover, including the ads, and his chief clerk and the men in the office also read it."

"Maybe you're right."

"I know I'm right, Boss, and don't forget that the division engineers and supervisors and a lot of the brighter foremen also read that paper—men whom we never see and can't afford to call on."

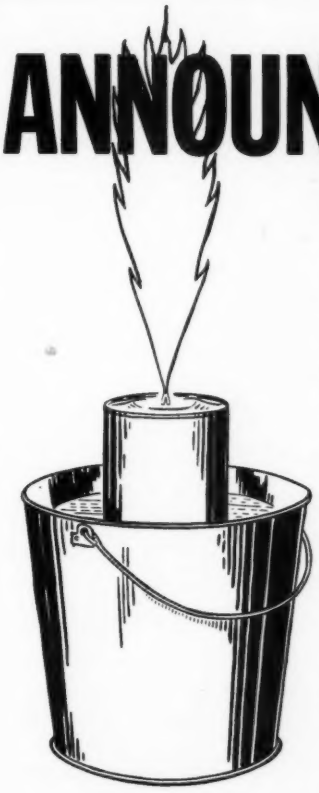
"That's true, too. Perhaps we'd better put our money into a campaign in that paper next year."



Railway Engineering and Maintenance Goes Every Month to 148 Supervisory Maintenance Officers on the Baltimore & Ohio System, located in **3 General Offices, 11 Division Headquarters and 61 Other Supervisory Headquarters,** Scattered All the Way from St. George, Staten Island, New York City, to Roodhouse, Ill., and Slater, Mo. This Magazine Also Goes to 45 Other Subordinate Officers Who Are in Training for Promotion to Supervisory Positions on These Lines.

RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS

ANNOUNCING a new, better EMERGENCY LIGHT



NEW, yet thoroughly tested and proven under all conditions of service, the REX EMERGENCY LIGHT is now accepted and used in quantity by several of the largest railroads. Advantages over other types of emergency lights are so outstanding and its price so low that it is sold immediately wherever demonstrated.

A simple, fool-proof valve action insures the even, steady generation of gas with low internal working pressure (about five ounces). No possibility of building up dangerous explosive pressures. Maintains a high, brilliant, constant light of from 250 to 350 candle power for 2½ to 3 hours.

Due to the valve action, only a portion of the carbide receives water at any one time. As the carbide gives up its gas the light sinks deeper into the water, picking up the weight of the water and allowing the moisture to enter at the next higher point in the light.

REX EMERGENCY LIGHTS can be carried in transit or in storage for long periods without deterioration. They operate merely by removing the hermetically sealed top and bottom and placing the container in water in a bucket, hole in the ground or a ditch. For maximum efficiency 14" of water is best.

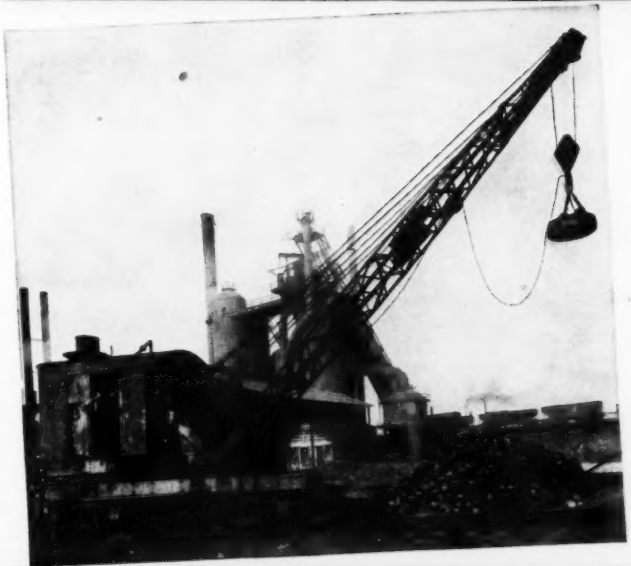
Weight per light 5 lbs. packed twelve lights to the case. Prices on application giving quantities required.

Hunter Manufacturing Corporation

REX EMERGENCY LIGHT DIVISION

25 Broadway, New York, N. Y. **Factory, Bristol, Pa.**

"Not a Single Kick in Nineteen Years"



There is no more severe crane service to be found anywhere than in the steel mills. How well Industrial Brownhoists do their job in this great industry is expressed in this typical letter recently received from one of the nation's steel makers.* "We are still getting splendid results from our four Industrial Brownhoists. We haven't had a single kick in nineteen years and, in our vocabulary, there is only one name for cranes—Industrial Brownhoist."

An Industrial Brownhoist on your work will do a real job of cutting costs in the handling of all kinds of materials with bucket, hook and magnet as well as car switching service. Our nearby sales engineer has some interesting figures with which you can compare your present handling costs. You'll be surprised at the savings such a comparison will show possible.

***Name on request.**

INDUSTRIAL BROWNHOIST

GENERAL OFFICES: BAY CITY, MICHIGAN

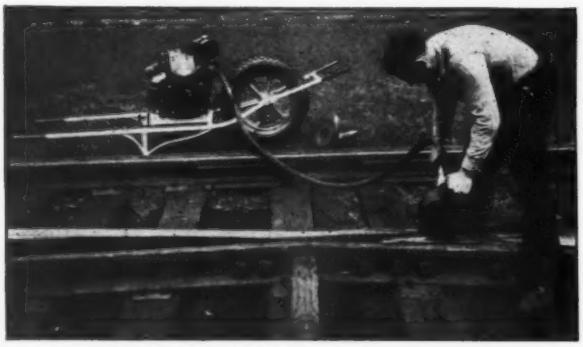
DISTRICT OFFICES

New York, Philadelphia, Pittsburgh, Cleveland, Chicago,
Agents in Other Principal Cities

Illustration shows one of four Industrial Brownhoists owned by the steel mill whose letter is quoted above.

Less Dollars Per Grind— More Grinds Per Dollar

Track maintenance economy depends on machines as well as men. The machines you use influence the cost of the job. For economy plus good work, rely on Railway Track-work Grinders. Many railroads do. Plenty of evidence of economy is available. A wide choice of models is described in Data Bulletins, sent on request.



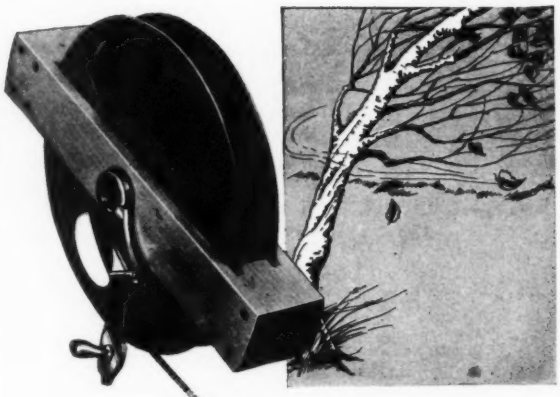
Railway Track-work Model P-22 Portable Flexible Shaft Grinder for free hand grinding of surface welds, flange ways, switch points and stock rails. Auxiliary attachments include ball bearing hand piece for cup wheel, rocker arm type cross cutter for slotting joints, track drill, etc. The grinder, powered by 4 hp. air cooled gasoline engine or electric motor as desired, has in every respect demonstrated its ruggedness and efficiency on leading railways. Many other models available.

Railway Track-work Co.

3132-48 East Thompson St., Philadelphia

WORLD'S HEADQUARTERS FOR TRACK GRINDERS

8742



"CANYON" CHAIN TAPES

HOLD THEIR OWN ON ROUGH GROUND AND IN HIGH WINDS

This sturdy "Canyon" Chain Tape is ideal for measuring in high winds. The extra thick and extra narrow tape (⅛ inch wide) cuts wind resistance to a minimum, won't readily catch on obstructions, and handles well on rough ground. Send for general catalog.

NEW YORK 106 Lafayette St. — THE LUFKIN RULE CO. SAGINAW, MICHIGAN — Canadian Factory WINDSOR, ONT.

TAPES — RULES — PRECISION TOOLS

NOW AVAILABLE

3rd Edition

STRING LINING OF CURVES MADE EASY

By CHARLES H. BARTLETT

To meet the continuing demands for this booklet, reprinting a series of articles published originally in Railway Engineering and Maintenance, a third edition has just been printed and is now available.

Written to meet today's exacting standards for curve maintenance, this booklet presents in detail a method of proven practicability for checking and correcting curve alinement readily with tools that are at hand. It makes possible the accurate realinement of curves without engineering instruments or other appliances than a string and a rule.

Two editions of this booklet, each of 1,000 copies, have already been purchased by track men. Send for your copy of this practical aid for track maintenance.

Fifty Cents a Copy

Railway Engineering and Maintenance

105 W. ADAMS STREET CHICAGO, ILL.

YOU CAN DO FASTER GRINDING AT LOWER COSTS WITH *Mall* RAIL GRINDERS!

TRADE MARK

MALL 5 H.P. Portable Rail Grinder.

Avoid costly rail replacement by building up the rail ends, frogs, and switch points by welding. The surplus metal can be removed quickly at low costs with one of these high speed tools.

Without cost or obligation, our Engineering Department will quote prices on the necessary equipment, or we will arrange a demonstration on your tracks.

MALL TOOL COMPANY

RAILROAD DEPARTMENT

7746 SOUTH CHICAGO AVENUE CHICAGO, ILLINOIS

SALES OFFICES IN ALL PRINCIPAL CITIES

Man hour Savings

coupled with

Man-Power, Safety and Alloy Steel heat treated Forgings

& Electrided Gibs

are definitely demonstrated in the

Simplex Track Jacks

and these

are the basic requirements for productive and economical service

★ ★ ★

Simplex Rail Puller and Expander for Lining Crossings and Renewing End Posts

and the

Simplex G-Y Tie Spacers

are also famous for productive savings

Templeton, Kenly & Co. Est. 1909 Chicago

New York — Atlanta — California, Pa. — Dallas — St. Paul San Francisco — Toronto. Representatives at London — Paris Milan — Johannesburg — Madras — Bangkok — Singapore Manila — Hong Kong — Shanghai — Rio de Janeiro — Buenos Aires.

CURVE RAILS ARE HARD HIT!

Each Meco Lubricator Protects a Number of Curves

Hard hit by thrust and friction from every passing wheel, curves urgently need lubrication protection.

Any kind of lubrication will do some good; but for maximum protection and to make curve rails last as long as tangent rails, install

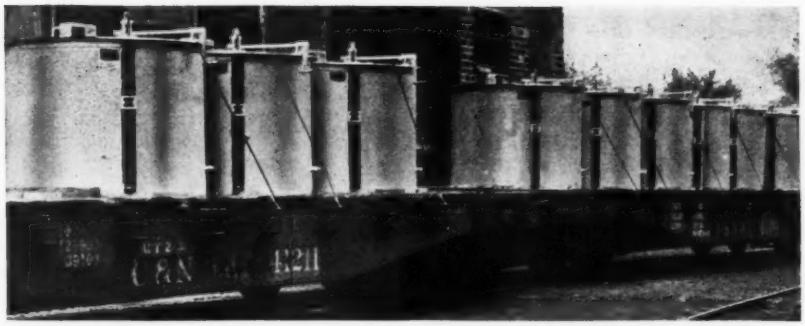
MECO LUBRICATORS

- Reduce cost of maintaining gauge and line on curves.
- Decrease replacement cost by prolonging curve-rail life.
- Decrease train resistance—cut fuel costs.
- Prevent wheel screeching on curves.
- Increase safety of train operation and permit higher speeds.
- Often eliminate helper service or permit higher tonnage ratings, where curve resistance is governing factor.

MAINTENANCE EQUIPMENT CO.

RAILWAY EXCHANGE, CHICAGO, ILLINOIS

Carload shipments of agitator tanks leave for wayside plants to handle Dearborn Water Treatment . . .



Another Railroad goes DEARBORN!

● Every tank in this shipment will reduce boiler maintenance costs for the railroad adopting this Dearborn wayside treatment. There will be no scale on locomotive flues and fireboxes. Foaming will be controlled, and boilers will be protected against pitting and intercrystalline corrosion. Equally important, locomotive boilers will need washing less frequently. That's why leading railroad systems in all parts of the country have turned to Dearborn for scientific boiler feed water treatment. Dearborn chemical engineers will be glad to discuss any phase of your boiler feed water problems with you. Write to have a representative call.

No Scale • No Corrosion • Clean Steam

Dearborn

TRADE MARK REGISTERED

Scientific Water Treatment

DEARBORN CHEMICAL COMPANY

310 South Michigan Avenue
CHICAGO

205 East 42nd Street
NEW YORK

807-815 Mateo Street
LOS ANGELES

2454 Dundas Street, West
TORONTO

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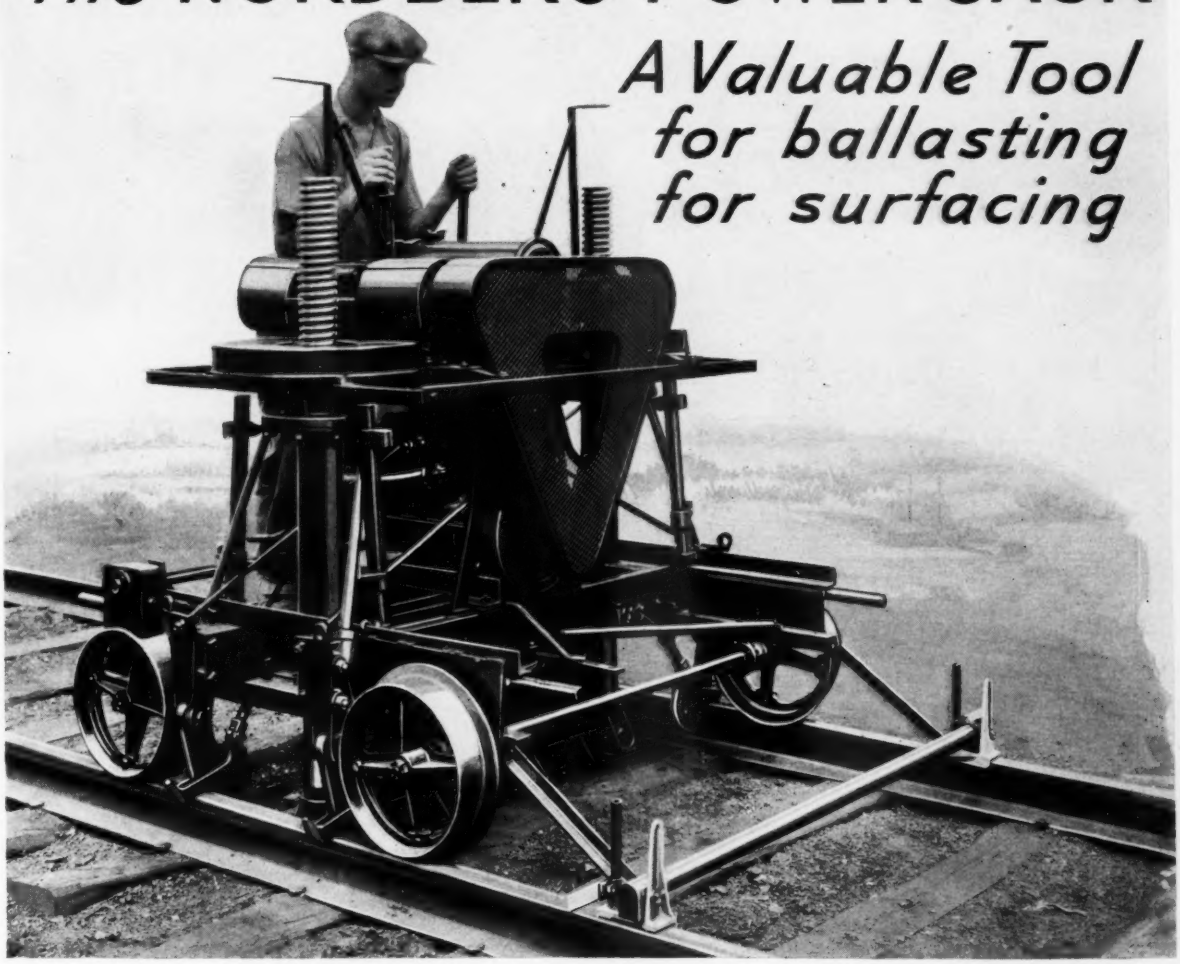
United States Steel Products Company 756-757

The NORDBERG POWER JACK

A Valuable Tool for ballasting for surfacing



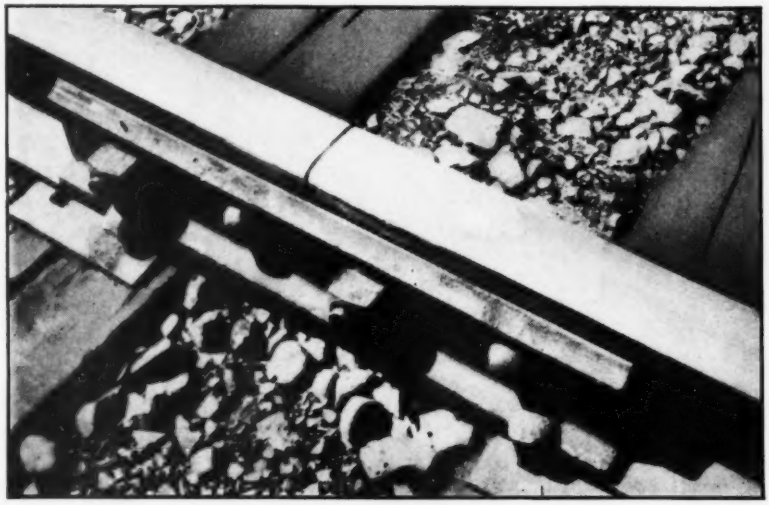
Raising track by hand is another maintenance operation which on many roads has been superceded by a more improved mechanical method, the Nordberg Power Jack. For ballasting and surfacing, this machine replaces the slow moving crew with hand jacks, saves labor, makes faster progress possible and provides a greater accuracy of lift. With an even, vertical lift, the track is not thrown out of line because of jacks slipping or kicking out. There is less possibility of injury to workmen. With a lift a minute, a Nordberg Power Jack easily runs away from any tamping gang. It is a valuable tool wherever track is raised.

The Complete Line of Nordberg Power Tools

Power Jack—Adzing Machine—Track Wrench—Spike Puller—
Surface Grinder—Precision Grinder—Utility Grinder—Rail Drill—Track Shifter

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

Export Representative—WONHAM Inc.—44 Whitehall St., New York



Oxweld Procedures for Rebuilding Rail Ends Lengthen the Life of Rail

The building up of battered rail ends was one of the early applications of the oxy-acetylene process to track maintenance. Oxweld procedures for this application have been developed and are applied under the direction of men of wide experience in railroad work. As a result, these procedures represent the most economical and most efficient method of reconditioning rail ends developed to date.

Year after year, the rail ends of thousands of miles of track are restored to original surface by Oxweld methods. The service life of the rail is lengthened, replacements are required less frequently, and track maintenance costs are reduced.

Rebuilding rail ends is one of many time-saving procedures developed by Oxweld in co-operation with American railroads to help them lower railroad operating costs. The Oxweld Railroad Service Company, Unit of Union Carbide and Carbon Corporation, Carbide and Carbon Building, Chicago and New York.

OXWELD
RAILROAD SERVICE

SINCE 1912

OVER A QUARTER CENTURY OF SERVICE
TO THE MAJORITY OF CLASS I RAILROADS